ELECTRICAL REVIEW

[ILLUSTRATED.]

A WEEKLY JOURNAL OF

ELECTRIC LIGHT, TELEPHONE, TELEGRAPH AND SCIENTIFIC PROGRESS.

(Formerly Review of Telegraph and Telephone.)

Vol. 7, No. 20. WEEKLY. NEW YORK, SATURDAY, JANUARY 16, 1886. $3 per annum. Single Copies, 10 Cents.

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Entered at Post Office, New York, as Mail Matter of the Second Class.

The Electric Lighting System of the Brooklyn Electric Construction Company.

In a recent issue the Review, through the kindness of Mr. E. R. Knowles, electrician of the Brooklyn Electric Construction Company, was able to give its readers an interesting account of the plant of this company at Lynchburg, Va. This week we illustrate the lamps, dynamo, etc., of this company, Their f ctory is located in Brooklyn, and the growth of the business is just now compelling an enlargement of their facilities. With the Moffatt Chichester patents as a starting point, they have added to them the devices of Mr. E. R. Knowles, who has perfected and rendered practical, the system which they are now introducing into use. The principles involved in the Knowles Moffat system are unique and broadly covered by patents now held by this company, and others which are now pending in the Patent Office. The dynamo used for arc lighting, is of the Gramme type, and is shown in Fig. 1. Its distinguishing feature among others, is its sectional armature, shown in Fig. 2, which admits of the building of a Gramme ring with very little expense, with uniformity of winding, and one from which any coil can be removed and rewound at any time without rewinding or disturbing the whole armature. The machine is compact, thoroughly well built and embraces many points of novelty and practical utility, all of which tend to make it durable, safe and certain as well as economical, in its action: We are informed that one of these machines, has been run constantly for four weeks, 23 hours a day under very trying circumstances, without giving any trouble and showing any signs of deterioration. These machines are all made to exact sizes and all parts are interchangeable, so that in case of accident any part can be obtained and substituted for the injured part with the least possible delay and expense. They are made at present, in three sizes of 5, 10 and 20-light capacity, and a 40 light size is now being added.

The commutator is somewhat novel in arrangement. It has a groove turned midway in its circumference, and each brush touches an independent bearing. As these brushes are a trifle narrower than the bearing point, it follows that the commutator is worn down evenly, and no grooves or ruts can be formed, which otherwise necessitates filing, and sometimes a re-turning of the commutator. There being, in addition, two brush-holders on each side of the commutator, a new pair of brushes can be inserted at any time while the machine is running, without stopping the current.

The single and double arc lamps are represented in Figs. 3, 4 and 5. They are of the simplest construction, containing no parts to get out of order, and are steady and positive in their action. These lamps work on what is known as the derived circuit principle, there being no differential action whatever; the feed being positive and the length of the arc as nearly constant as seems possible for it to be kept, never varying more than one-hundredth of an inch from its normal length. There are no levers or springs in the mechanism of this lamp, all of the action being accomplished by the direct action of magnetism and gravity. The lamp is of pleasing appearance, and is thoroughly insulated by incombustible insulation, and it is claimed that it is impossible for it to be burnt out, owing to carelessness on the part of the trimmer. The globes are held in such a way that they can be lowered, when it is necessary to trim the lamps, or to get at the lower part of the lamp, thus doing away with any necessity for taking the globe off the lamp and lessening the liability to breakage. The double or all night lamp, shifts automatically and positively from one set of carbons to the other, at the proper time, striking its full arc instantly, and so quickly is the change made that it is barely perceptible. The current can also be shifted from one set of carbons to the other, back and forth at will, while in action, thus enabling the lamp to be kept constantly running, without stoppage, for any length of time.

This company furnish with each dynamo a simple and novel indicator, shown in Fig. 6, whereby the proper strength of current to be supplied to the lamp circuit can be ascertained and regulated, and which shows every variation and fluctuation of the same. This indicator is arranged both with and without a bell attachment, which, when the current falls below or rises above a fixed amount, rings a bell, and calls the attendant's attention to the fact.

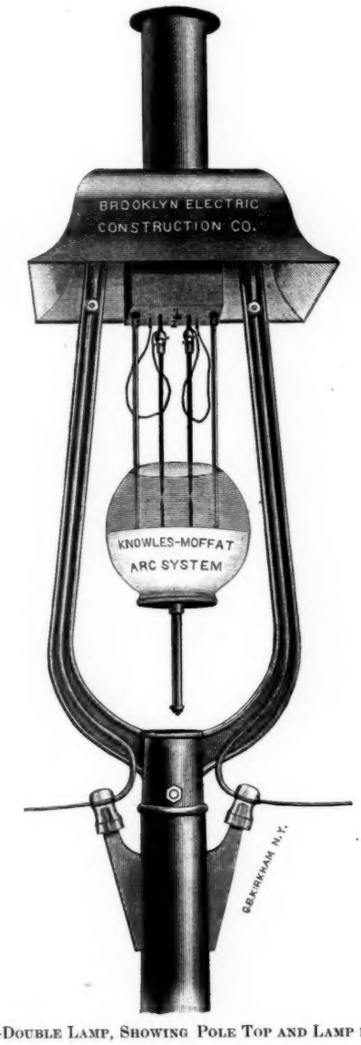


Fig. 5.—Double Lamp, Showing Pole Top and Lamp in Circuit.

An automatic regulator is also furnished where required, by which the current is kept absolutely constant, every fluctuation being taken up and provided for, the apparatus being extremely sensitive.

Fig. 5 shows the pole-top used by this company, and the general arrangement of the lamp when in working circuit. The lamp is absolutely insulated from the frame, and can be taken out and put in without breaking the circuit, or disturbing the general apparatus in any way. For compactness and simplicity, we find many commendable features in this system.

The Transmission of Power by Electricity.

Few people in the city of Boston are aware how successfully this has been accomplished in this city by the Massachusetts Electric Power Company. At 197 Congress street it has in use two dynamos of 25 horse-power each that are run by being belted direct to a 50 horse-power Armington & Sims engine. The steam is generated in a steel tubular boiler set with the Jarvis furnace, and coal screenings are used for fuel. This power is transmitted all over the city, and is used for running all kinds of machinery, including sewing machines, ventilator fans, printing presses, elevators and other work. The demand for power far exceeds the supply, as the company has let all the capacity of their engine, and have applications for 300 horse-power more. It is the intention of this company to start a station to be run exclusively to let power. The present plant has been in operation over eighteen months, and the only interruption has been three hours, when other parties cut their wires by mistake. In many cases these motors have supplanted small steam engines, gas engines and hired power. Customers claim that the power is more regular than they have ever used before, even when coming from the adjoining buildings. The future of this system is filled with possibilities. It will eventually become the motive power of all the present horse railroads. In a few years elevated electrical railroads will be as plentiful as steam railroads are now, and in time it will supersede the present system of running locomotives on all railroads,—and why not? It is simply a question of cost of making power. It is acknowledged by every practical engineer that the present system of making steam in locomotive boilers is expensive as well as wasteful. The evaporation of pounds of water to each pound of coal consumed to make steam in locomotive boilers does not average over 3½ pounds of water, using the best grades of bituminous coal while with stationary boilers set with the Jarvis patent boiler setting, using coal screenings for fuel, an evaporation of nine pounds of water to one pound of fuel is made, and the reduction in cost of fuel is from one-third to one-half. It is only a question of time when all the different electric lighting stations in this country will use their engines in the day time to make power to be sold for manufacturing purposes, the same as they sell power in the form of electric lights now. They can also furnish power to run electrical railways, elevated or surface. The economy of this system over the cost of running horses, as used now, will be over 50 per cent. Any parties interested in this system, and who wish to see it in operation running machinery, can do so by visiting the following places in this city, where it has been in use the past twelve months: Boston Safe Deposit and Trust Company, 87 Milk street, Post-office square; H. C. Dimond & Co., machinists and sewing machines, 22 Milk street; Walker, Young & Co., printers, 43

Kilby street; Wm. H. Chandler, printer, 21 Cornhill; John A. Swasey, 35 Pemberton square; Enos Electric Railway, 1 Pemberton square; Otis Clapp & Son, drugs, 3 Beach street; J. W. Chamberlain, printer, 178 Washington street; McCrillis & Kendall, manufacturers of matresses, 64 Washington street; James E. Wall, printer, 73 Cornhill; Stein Manufacturing Company, sewing machines, 81 Union street; Ar. Showe & Co., coffee grinding, 25 Union street; Wallace & Gould, paper rollers, 32 Hawley street; American Automatic Fire Alarm Association, 77 Water street; S. M. Spencer, machinist, 112 Washington street.

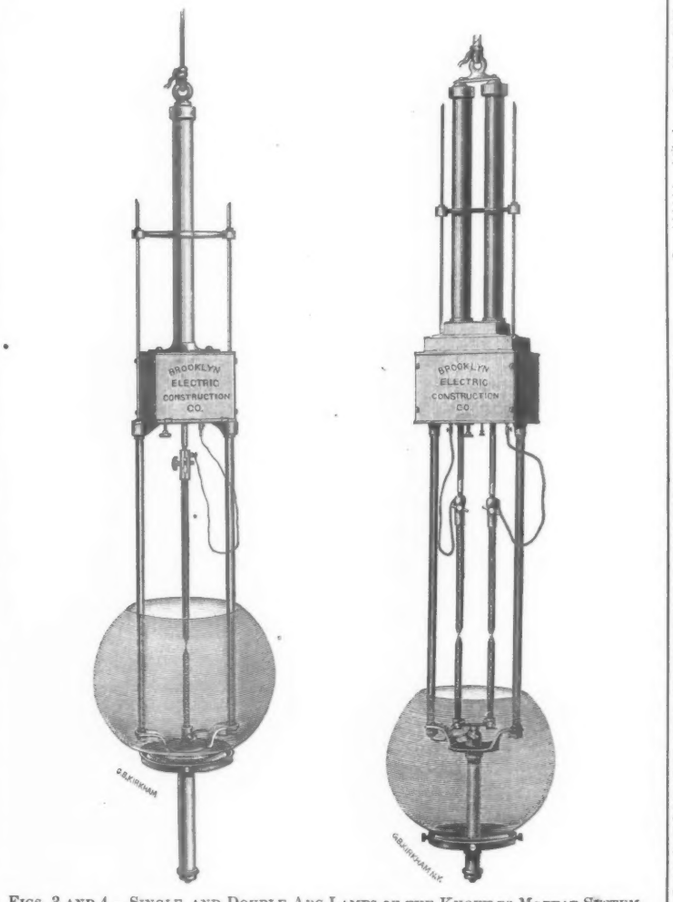
Economy Test of the Harrisburg Central Station.

The following report of the test in evaporation on the battery of tubular boilers set with the Jarvis Patent Furnace at the Harrisburg Electric Light Company, Harrisburg, Pa., was taken from the original report. This central station is what is called an overhead wire station:

"In conjunction with the investigation of the Harrisburg Central Station, an important economy test was carried out (August 29th and 30th), covering a twelve-hours' run, from 6 P. M. to 6 A. M., to determine the efficiency and reliability of the various station units, as well as the economy of working of a typical Edison central station, working under the normal conditions of load, etc. Twelve persons took part in the test and through a systematizing of the arrangements of the test beforehand, the tests of boilers, engines, dynamos, testing instruments, readings, indicator cards, etc., being taken under the stroke of a gong at stated periods—all timepieces being set to one standard. The apparatus used was of a standard pattern, compared with accurate standards. The measurements and weight of water and fuel were taken by Mr. Hammond, of the Jarvis Engineering Company, and Mr. Beggs, treasurer and general manager of the Harrisburg Electric Light Company. The scales employed were tested with U. S. standard weights and the water measured in a standard tank, the water being run into same to a given level and weighed by the above standards. The temperatures of water in tank and feed-water were taken with standard thermometers, reading to tenths of a degree, and checked by standard thermometer having a "Yale" certificate The temperature of the gases in the stacks were taken with a pyrometer supplied by the Jarvis Engineering Company. The stacks being of iron, and two boilers working into each stack, an opening was made into each, and the temperatures were taken alternately. During the running of the three boilers (one boiler not being used in test) the difference in the temperatures in the two stacks was inconsiderable. The draught in the two stacks was taken by means of the apparatus devised by Purkett Webb, of Cornell University, the same having been indorsed by the Franklin Institute Test Committee, of Philadelphia. During the test no water was thrown under the grate, and the fuel contained only the moisture which it contained when delivered—*i. e.*, 1.77 per cent.—which was allowed for in the calculations. The mixture used during the test was three parts of anthracite screenings to one of soft coal (Clearfield bituminous)—the value of this mixture being $1.2275 per ton of 2,000 pounds delivered in station.

"Prior to the test, an examination was made of the boilers, and they were blown off and cleaned thoroughly; they were then brought up to their normal working pressure and at the time of start, the fires were quickly drawn, the furnace and ash-pits cleaned, and new fires started with 600 pounds of wood, which was allowed for on the basis of .4 of a pound of coal per pound of wood The coal used in starting the fires was a trifle richer than three parts screenings to one of soft coal, but later this was allowed for, so as to maintain these proportions throughout. A strip of black court plaster was pasted at the height of the water in the gauge glass, and the water held at the same height at the end of the run. The conditions at the start were maintained the same, so far as concerned the boiler pressure, height of water, etc. No fuel remained on the gates at the end of the test, the last serving being worked very close.

"The temperatures of the feed-water were taken from water drawn into a pail from the feed in pipe midway between the heater and boiler, the first pailful in each case being poured away to prevent loss by cooling in the pail. Tests were also made at the heater, and at the points of feeding into the boilers. The water was supplied to the standard measuring tank from the city mains, and drawn into a reservoir beneath, and pumped thence through the feed-water heater by a 'New Era' pump, which was backed up by a Korting injector. Cards taken from the pump showed an average of one horse-power ind. Immediately after the test the fires were drawn, and all ashes and refuse weighed on the fuel scales.



FIGS. 3 AND 4.—SINGLE AND DOUBLE ARC LAMPS OF THE KNOWLES-MOFFAT SYSTEM.

"The steam pressure was taken from a standard gauge, which had been tested previously at the Pennsylvania R. R. car shops. The individual gauges which read closely were not considered.

"The showing, so far as the boilers were concerned, being admirable, and speaking well for the Jarvis patent boiler setting with which they were set. The boilers (of which the station has four) are of the single return tubular type. Their principal dimensions are as follows:

Diameter of shell	72 in.
Length of shell	15 ft.
No. of tubes	120
Diameter of tubes	3 in.
Length of tubes	15 ft.
Width of furnace	75 in.
Length of furnace	72 in.
Grate bars: 10 full bars, 6" x 6'. Deep side bars, with are cross-sections, 5-16 in. thick.	
Width of air spaces, ⅝ in.	
Air space is 50 per cent. of grate surface.	
Height of chimney	70 ft.
Diameter of drain, at base	46 in.
Diameter of drain, at top	52 in.
Area of chimney	1661 sq. in.
(Two boilers connected to one stack.)	
Draught area through tubes,	729.96 sq. in. to each blr.
Area of smoke-box	729.61 sq. in.
Area of grate surface	37.43 sq. ft.
Total heating surface	1626 sq. ft.
Steam space	99.14 cu. ft.
Water space	236.66 cu. ft.
Mean water line,	6½ inches above top row of tubes.

"The electrical tests were carried out as follows: Two standard E. M. F. testing-boxes, which had previously been compared, were connected at the ends of the omnibus wires in the station, and indications were frequently taken to determine the variation on both sides of the three-wire system. Upon the next floor, in the rear, a room was fitted up for taking readings from time to time by means of a Thomson reflecting galvanometer, which was used to check off the readings of the main, neutral and individual (shunt) amperemeters in the dynamo room down stairs, which readings were taken at the stroke of the gong. The various machines used in the test were of the No. 20 type, 400 amperes, were tested individually and in pairs, and by means of a large switch they were connected through a german-silver shunt having a capacity of 1,200 amperes.

"Prior to the test, tests were made of the dynamos as to insulation faults, etc., and they were found in perfect order. Tests of their speeds were taken throughout the test, which showed but a slight variation.

Data of Economy Test of Harrisburg Central Station.

Date of test	Aug. 29th and 30th, 1885
Duration of test	12 hours.
Average boiler pressure	77.22 lbs.
Average temperature of feed-water	178.47° Fahr.
Average temperature of escaping gases,	315.869° Fahr.
Average No. of amperes	689.6 amperes.
Average electrical horse-power	107.35 E. H. P.
Average No. of 10 C. P. lamps burning	1532.44
No. of 10 C. P lamps per ind. H. P.	10 63
No. of 10 C. P. lamps per electrical H. P.	14.28
Character of fuel: Mixture of one part of Clearfield bituminous, price $2 21 per ton of 2,000 lbs. del'd, with three parts of anthracite screenings at 90 cents per ton of 2,000 lbs. del'd.	
Amount of soft coal consumed	2973 lbs.
Amount of screenings consumed	6667 lbs.
Amount of wood was 600 lbs., equal in coal to	240 lbs.
Total amount of fuel consumed	9880 lbs
Percentage of moisture in coal	1.77 p. c.
Dry coal consumed in test	9705.124 lbs.
Total ashes and refuse	1492 lbs.
Per cent. of ash and refuse to fuel consumed,	14.6 p.c.
Total combustible consumed	8282.124 lbs.
Average dry coal consumed per hour	808.76 lbs.
Total cost of fuel consumed	$6.47
Bituminous, $2 21 per ton	3.285
Anthracite, $0.90 per ton	3.000
Wood equivalent to coal at $1.55½ per ton	.185
Total	$6.470
Total water actually evaporated under observed conditions	88.413 lbs.
Factor of evaporation	1.0703
Equivalent evaporation from and at 212°,	7885.7 lbs. per hour.
Water actually evaporated per lb. of dry coal,	9.109 lbs.
Equivalent evaporation per lb. of combustible from and at 212° Fahr	11.42 lbs.
Equivalent evaporation per lb. of coal from and at 212° Fahr	9.749 lbs.
Commercial evaporation	8.2788 lbs.
Total heating surface	1626 sq ft.
Steam space	99.14 cu. ft.
Water space	236.66 cu. ft.
Area of grate surface, each boiler	37.43 sq. ft.
Area of chimney	1661 sq. in.
Ratio of heating surface to grate surface,	43 44 to 1
Ratio of grate surface to chimney area	3.24 to 1
Nominal H. P. rated on 11 sq. feet of heating surface per horse-power	147.8 H. P.
Dry coal actually consumed per hour per sq. ft. of grate surface	8.642 lbs.
Water evaporated per hour per sq. ft. grate surface from and at 212° Fahr	64 271 lbs.
Average dry coal consumed per ind. H. P.	5.61 lbs.
Area of heating surface	1626 sq. ft., in each boiler.
Pounds of water evaporated from and at 212° for $1 worth of fuel	14,626.72 lbs.
No. of candles per ind. H P	106.3 C. P.
No. of candles per electrical H. P	142.8 C. P.
No. of candles per hour for 1 cent's worth of fuel	284.31 C. P.
Cost of fuel per H. P. per year of 365 days of 12 hours each	$8 92

Electric Governors.

An electric governor, for electric motor service, is described in *Iron*, that suggests an important invention. This is not designed to keep the engine at a constant speed, but to vary the revolutions in accordance with the demands made upon the dynamo machine it isi ntended to drive. A part of the current generated by the dynamo is caused to circulate in the coils of the solenoid, the result being that the core is drawn up to a greater or less extent, the lifting action being aided by the spring. This core is connected to the throttle valve by link and lever, the latter being pivoted between a pair of jaws on the valve castings, and engaging with the spindle by means of a finger or tongue. This finger is not an exact fit in the slot in the valve spindle, its office being merely to depress the valve in opposition to the steam pressure, which preponderates on the lower side of the valve. The valve spindle is made in two parts, which are kept in contact by the opposing action of the solenoid and the steam pressure. When the governor is used in conjunction with a "series" dynamo driving are lights, the solenoid is placed in the main circuit. When a lamp is extinguished the current immediately increases, owing to the reduced resistance of the external circuit; the core is instantly raised, reducing the amount of steam and checking the speed of the engine until the current is decreased to the former amount. Thus as the number of lamps is reduced the speed of the engine gradually falls. With compound engines it is often preferable thus to lower the speed as less work is required, because there is for such engines one point of cut off of maximum efficiency, and if the point be widely departed from they may become exceedingly wasteful. Supposing the governor, as we have already assumed, be applied to an engine working a circuit of arc lamps, it will respond to every increase or decrease. But should all the lamps be extinguished, or should the circuit be ruptured, a new condition arises. The solenoid loses all its power, and turns the steam full on at the moment when it should cut it off entirely. To prevent this the subsidiary magnet is introduced. It has a heavy pivoted armature, which is constantly held against the poles of the magnet as long as a determined amount of current is flowing. But should the current fail, the armature is no longer supported, and falls, its lever coming in contact with the top of the valve spindle, and forcibly closing the valve, which has only a short range. When the governor is used for incandescent lighting it is usually employed in conjunction with a shunt-wound dynamo, and its coils are arranged as a shunt between the mains. It then keeps the electromotive force constant, increasing the revolutions as lamps are added to the circuit.

Electric Lighting in California.

At a recent meeting of the Sacramento (Cal.) city council the following propositions for the lighting of streets for the ensuing year were opened, read and action upon the same postponed until 10 A.M. Thursday :

Sacramento Electric Light Company—Electric arc lights, of 3,000 candle power each, at the rate of $22.91\frac{1}{2}$ per lamp per month. To place the same on masts 150 feet above ground, four lamps to each mast, or place the same on poles 60 feet high. Will light the entire city with twelve masts at $1,100 per mast.

Pacific Thomson-Houston Electric Light and Power Company—Electric arc lamps of 2,000 candle-power, on masts of 150 feet, four lamps on each mast, $1,000 per mast per year, or $83.33 per month. On 60-foot masts, one lamp on each mast, for $252 per mast per year, or $21 per month. Lamps suspended over the intersection of streets, for $252 per year, or $21 per month. All masts or suspended lamps to be located as directed by the Board of Trustees, and to burn every night except on bright moonlight nights.

Capital Gas Company—Will furnish gas of same illuminating power and quality as heretofore, and will light 185 or more lamps, if desired, on the same terms and conditions as for the past year, viz : $3.90 per lamp per month, provided the location of the lamps are all west of the east line of Twelfth street, and the number of same be not decreased. Or the company will furnish gas and light not less than 300 city lamps within that part of the city limits where the gas company have or may hereafter have their gas mains laid, for the sum of $3.50 per lamp per month ; conditions and quality of gas as before.

A petition, as follows, signed by four hundred citizens, was read and placed on file :

"We, the undersigned, property holders and residents of the city of Sacramento, residing east of Twelfth street, respectfully represent that about one year ago your honorable Board made a contract with the Sacramento Electric Light Company to light that portion of the city by electricity for one year, with four masts and four lamps to each mast. That while that number of lamps are insufficient to light that whole area, they do good service for 120 to 130 blocks, and we earnestly indorse that system for that portion of the city. Our back yards and alleys are lighted as well as the streets We hereby petition your honorable body to continue the same mast system, and to increase the number of masts as your finances may justify.

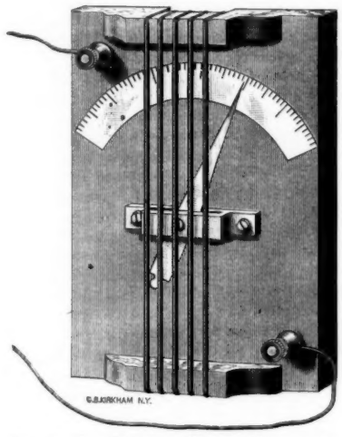


Fig. 6.—The Knowles-Moffat Indicator.

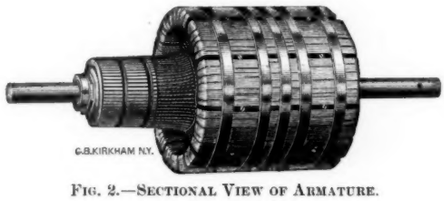


Fig. 2.—Sectional View of Armature.

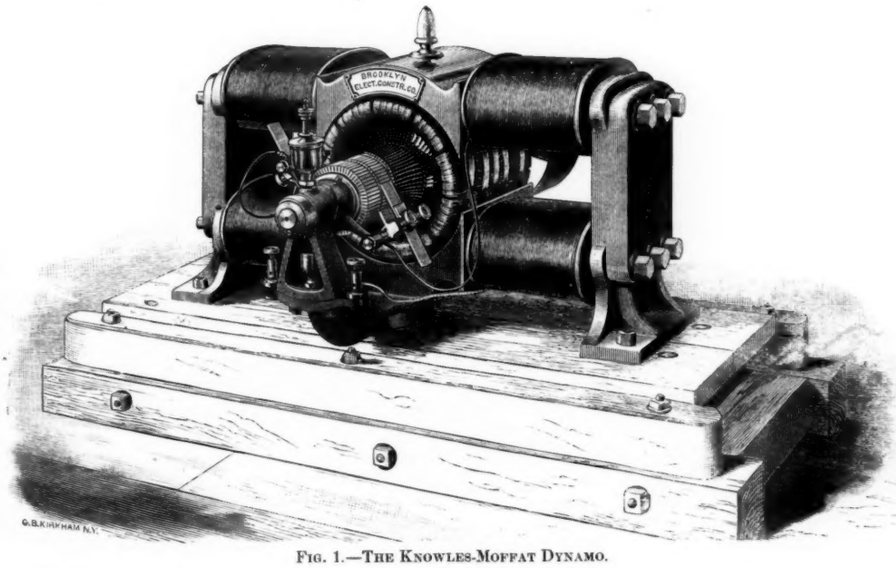


Fig. 1.—The Knowles-Moffat Dynamo.

Inventors' Exposition of Working Models.

There is a very large amount of money in the treasury of the United States which has been collected from inventors in the shape of fees exacted from applicants for patents. Instead of expending the gross amount of receipts in the maintenance of the Patent Office, increasing its facilities and advantages and making it a better guide and more potential stimulant to invention, a large balance of receipts, in excess of expenditures, has been annually deposited in the treasury.

Thus the Government has assumed the right to put a tax or penalty on invention, and make this branch of the public service tributary to the support of departments which yield no income. It is a fact which has heretofore been noted in these columns that departments which bring in no returns at all are supported with a degree of liberality entirely unknown to the management of the Patent Office. Because this office was intended to be self-supporting—an agency managed by the Government in the interest of inventors and the general public—Congress has acted on the theory that it ought to be made a source of profit, and has, therefore, failed to expend the money taken from inventors in promoting the great interest for which the office was established. This is as unjust as it would be to impose excessive postage, and get a surplus from the Post-office Department to support the army. Nor is its injustice its worst characteristic. It is a fatal policy to tax the inventive genius of the country, to make it pay penalties, and this is precisely what Congress has been doing for a good many years.

Invention is not a misdemeanor, inventors are not criminals, and it is high time to reverse this policy—to expend the money that has accrued and that may hereafter accrue, on a grand and comprehensive enterprise for the encouragement of invention and for the education of the people in the scientific and mechanical progress already achieved. Let the fees of the Patent Office remain as now fixed by law, and let all the constantly increasing income be utilized for the stimulation of thought, the suggestion of new paths of progress, the possibilities that one man's triumph suggests to the mind of another, so that our great temple of invention may enter upon a broader field of usefulness and become what it ought to be—the great mechanical educator, not only of the United States, but of all the nations of the world.

The *National Republican* proposes the establishment, by act of Congress, of a new temple dedicated to inventive genius, in which motive power, shafting, and all appliances necessary for the running of machinery shall be furnished free of cost. Inventors or owners of patents should be invited to set up working models in this building—or in any of the numerous buildings that would eventually be required.

For motive power the current of the Potomac river is all that could be desired. Under patents already issued the River and Rail Electric Light Company could make the Potomac generate electricity sufficient to run miles of machinery and light Washington or any number of cities. The source of power is practically inexhaustible, the means of transmission and storage adequate for any purpose.

Here at our feet, in this beautiful river, we have the silent but almost omnipotent agency which can readily be made to generate all the force needed to carry out this beneficent idea—an idea whose value is almost inconceivable, whose magnitude assumes grander and grander proportions as it is made the subject of intelligent study.

If there be one thing more important than any other in the progress of invention it is to bring the dreamy, self-absorbed inventor—the man who moves among men unconscious of their existence, whose very soul seems to have gone out of him, so intent is he on the one subject to which he has given his life—into closer relations with practical business men and business methods. Many noble intellects are wasted, many lives that might have been great are frittered away because these dreamers do not know, and have not the means of knowing, what might be learned in a few minutes in such a grand university of mechanical motion and applied science as we now propose.

Not many months ago an old man came to Washington from a distant State bringing with him a model of a piece of mechanism, on which he had worked for thirty-five years, giving not only his time, but expending a comfortable competency in carrying his invention on, step by step, until it was complete. He came here for the purpose of taking out a patent. He was not a crank, but a calm, resolute, brave man. Yet he believed he held a fortune in the box that contained his model. He had put his life into it, and he believed it was destined to give his family the wealth he might have obtained had he devoted the last thirty-five years to business pursuits. Before going to the Patent Office the gentleman decided to call on a distinguished mechanician then on duty at the Washington Navy Yard. He called accordingly, told his story in simple words, opened his box, and placed the model on the desk at which the mechanician sat. That gentleman looked at it a moment, gravely shook his head, reached for a book in a case near by, looked at the index and, opening it, quietly placed before the inventor the picture of a working model of his invention—patented and found practically worthless many years before.

It were useless to write for any person who does not know that such a discovery to that old gentleman was an almost fatal blow. And it would seem almost equally useless to add that, if instead of being packed away in darkness and obscurity the working models of inventions were put in motion, the people would know what had been invented and lives would not be wasted, hopes blasted, and minds wrecked by working over ground already worked.

The advantages of such a temple of applied science are almost innumerable—the disadvantages none. It would cost the country nothing, for its maintenance is entirely feasible by the plan we suggest—the use of the surplus of the office. It would be the greatest mechanical school on the globe, the greatest practical instructor in science and its utilizations. It would bring invention and capital into mutually beneficent relations and become one of the most potential factors in our national progress.

The *National Republican* intends to keep this subject before Congress and the people, and invites inventors and their friends throughout the country to petition Congress to give practical effect to the idea suggested. The first step should be the preparation of plans, not only for the present, but for the distant future—plans that will bear indefinite extension to meet the growing demands of stimulated invention.

—— The Commercial Telegraph Company, 18 Broad street, have ordered another dynamo of the United States Illuminating Company and will have an additional number of Weston incandescent lamps put in. The house of Lawrence & Herkner, this city, received the order for belting.

Electrical Review.

Published at 23 Park Row.

P. O BOX 3329.

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We invite correspondence from Electricians, Inventors and the Telegraph and Telephone fraternity and those engaged in Electric Lighting on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.

Mr. J. Viennot, 150 South Fourth Street, Philadelphia, is our accredited representative for Pennsylvania.

Mr. C. C Haskins, 118 LaSalle Street, Chicago, Ill, will represent the REVIEW in the West

Messrs. Wm. Dawson & Sons, 121 Cannon Street London, England, are our representatives for Great Britain.

NEW YORK, JANUARY 16, 1886.

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The large factory of the Thomson-Houston Electric Company, at Lynn, Mass., is to be doubled in size and capacity, the immense business of the company requiring this addition.

We understand that the New York Subway Commission has finally reached a decision in the matter of recommending an underground system after examining the claims of over one hundred applicants. This decision, which will be of considerable interest to the electrical field generally, will be announced in a few days.

To convey to our readers an idea of the remarkable progress being made in incandescent electric lighting, it is but necessary to note a few of the large installations recently established by one company, in this city, that of the United States Illuminating Company, operating the Weston system. The fine work done by this company can be seen at Delmonico's, Post-office, Gilsey House, Hotel Dam, Hotel Brunswick, Union Square Hotel, Washington Building, Equitable Building, Union Club, Lotus Club, and New York Press Club, which comprise but a small part of the incandescent lighting that the Illuminating Company alone has installed, not to mention the good work being done here by other companies in the same field. It is worthy of mention in this connection, that the majority of the Illuminating Company's installations are run from central stations.

Mr. Joseph P. Davis, of this city, has resigned the vice-presidency of the Metropolitan Telephone Company after several years of valuable work with this company. His successor is Gen. H S. Huidekoper, formerly postmaster of Philadelphia, who will move to New York and take an active part in the management of the extensive affairs of this company. Gen. Huidekoper is a gentleman of fine executive ability, an old soldier whom civil-service reform did not succeed in keeping in office, and will receive a warm welcome from the telephone fraternity.

The remarks of Mr. Cleveland, vice-president of the National Electric Light Association, which appear in another column, express the wishes, we have no doubt, of all the members of the Association. There is more interest shown in the organization at the present time than its most sanguine advocates expected to see at this early date, and that this is largely due to the energetic work of President Morrison all will agree. Another year of the same intelligent management will, as Mr. Cleveland says, place the organization beyond all danger of a relapse.

ANOMALIES IN THE ELECTRIC-LIGHTING BUSINESS.

The electric-lighting business of to day presents some curious anomalies. In all other businesses that we can call to mind, progress, by which we mean the demand for material or service, continues at the same rate. For instance, when india-rubber galoshes were first introduced, and their value became known, there was a general and increasing demand, which knew no pause in one district or in another. But with the electric light it is otherwise. So long as the service is well rendered, the demand increases so fast that the local company finds itself suddenly possessed with more patronage than it can conveniently take care of, and must needs call its members together to arrange for extension, of plant and facilities The local electric-lighting company of Portland, Me., has, for instance, just been called upon to greatly enlarge its facilities. In many other localities that we hear from, the demand exceeds the limits of the present supply. But this gratifying condition of business is to be found only, as we have said, where the electric lighting people are industrious, capable and enterprising. In localities where the company is careless and unaccommodating, and the service slovenly, the converse is the case, and instead of an increasing demand, even those who have used the light are disinclined to continue. We have heard of several such cases, and, no doubt, there are many of them. Some people are as unfit to enter the electric-lighting field as they are to run a stock-farm. The fact is that this business requires an altogether different order of talent than that required to make a corner grocery store successful. Light companies should look sharply after their employes.

EVILS OF GOVERNMENT TELEGRAPH CONTROL.

We learn from Washington that Senator Edmunds has introduced a bill authorizing the Government to go into the telegraph business. The details of the measure, and the arguments set up to warrant the necessity for the measure, have become familiar to the electrical fraternity, through the columns of the ELECTRICAL REVIEW, and it is therefore unnecessary to traverse them again *ab initio*. To our mind, and we have given some attention to this matter, the evils complained of in the present system, and which are made the *raison d'etre* for the new movement, can be checked by the legitimate powers of supervision which inhere in the National and State governments, over inter-State commerce.

No one, outside of the telegraph monopolies, will deny that evils exist, and crying ones, too; and yet no thinking man, who has studied the past experience with popular government, can deny that remedies can, and are likely to be, found.

It must seem curious to those familiar with the spirit, as well as the text of the Constitution, to see such a measure, as that proposed urged by so eminent a Constitutional lawyer and statesman as Senator Edmunds of Vermont. That the designers of the Constitution, and the forefathers of the Republic, were opposed to centralization of power by the Government, is shown in everything they said and wrote A government with, for and by the people was their motto, and the phenomenal success which has attended the institution of republican principles may be looked upon as the direct result of their teachings.

The number of public servants is already too great; at times, during elections, we mean, this multitude of adherents and partisans has proved almost dangerous. The Post-Office has more than once been used to further the interests of the Ins, and check or defeat the legitimate efforts of the Outs. To increase this army of office-holders would be but to enhance the value of the Post-Office as a political machine.

It might also be shown that the State has no right to enter the field as a competitor against legitimate private interests, and that, while it has power "to build and maintain post roads," it has not the power to build up and maintain a great political faction, depending upon a certain political party for sustenance, and ready, at any moment, to throw themselves into the balance to thwart the will of the people, which, under a republic, is sovereign.

THE PRESIDENCY OF THE NATIONAL ELECTRIC LIGHT ASSOCIATION.

Editors Electrical Review:

In your issue of Jan. 9th, after paying a high compliment to the officers of the National Electric Light Association (which they will gratefully appreciate), you refer to the President, J. F. Morrison, Esq., and say, what has been generally understood, viz: that for business reasons Mr. Morrison does not desire a re-election. We are all aware that he has large private interests to manage. We are also aware that the office of president of the National Association is one of great responsibility, involving the expenditure of much time and hard work.

But it is safe to say that no gentleman connected with the Association could have done as much to secure its present success as Mr. Morrison has done, and I am receiving letters from our members, in all parts of the country, asking me to do all I can to persuade him to reconsider his decision, and consent to a re-election. I believe that every member of the Association desires to vote for Mr. Morrison, and will do so if he will consent to the use of his name. Our Association is young but it is remarkably vigorous, and another year's growth, under the intelligent and energetic management of President Morrison, and whoever may be associated with him in official service will place it beyond all danger of a relapse. I cannot believe that Mr. Morrison, understanding the deep feeling of the Association upon this matter, will insist upon retiring from the office which he has so successfully filled.

H. M. CLEVELAND.

Hartford, Conn., Jan. 12th.

GENERAL WESTERN NEWS.

The Milwaukee Council, on the 4th inst., gave favorable consideration to an ordinance repealing the Dorsett Underground Service Company's franchise, and upon an ordinance granting a franchise to the Dorsett Underground Conduit Company being reported from the Judiciary Committee, it will be favorably acted upon by the Council. This municipal body is convinced that the incorporators of the Underground Conduit Company have by unfair means been deprived of their intended privilege, and is further determined that the Dorsett system of conduits shall be used in Milwaukee's proposed plant. By to-day's action it is probable that the rights of the company's incorporators will be restored, and that the laying of none but the favored system of conduits will be allowed. The answer filed to-day by the alleged fraudulent stockholders to the complaint of a recent suit instituted by the Dorsett people practically admits every charge, except that of fraud, as made by the complainants.

Some further progress has been made in the case of the city of East St. Louis and the poles. The city sued the Western Union Company for maintaining a nuisance, and Justice Shea gave a judgment for the plaintiff for $50 and costs. The defendants appealed, and the probability is that the case will eventually reach the Supreme Court of the State before a definite settlement is reached.

In Decatur, Ill., on the 5th inst., a mortgage for $1,200,000 was filed by the United Lines Telegraph Company in favor of the Farmers' Loan and Trust Company of New York. The document is to draw interest in gold until 1905.

There are several outside telephone companies who have placed more or less of their stock in this city. The company most largely represented is, perhaps, the Globe, the principal stock of which company is held here, Philadelphia and New York. The total stock of the company is reported to be 100,000 shares of one hundred dollars each. Its hopes of success are based on the Meucci patent, which it owns, and it has been one of the principal telephone contestants. Its advocates claim that recent investigations before a commissioner in New York, at which representatives of the Bell Company were present, are strong in its favor, and that if the Department of the Interior will only give them a fair show they will knock all the blemishes out of the wicked monopoly. In order the more perfectly to insure success, it is suggested that they pool issues with the inventor of the snapper sounder. He holds a strong card, and, while we are on this subject, the following, from the Chicago *Times* of the 8th instant, will be rather interesting to "stockholders of record at the close of business" on the day the suits are decided:

"TELEPHONE STOCK.

"Joseph Reynolds, a noted capitalist and owner of the line of Mississippi steamers from St. Louis to St. Paul, filed a bill in the Circuit Court yesterday against Chas. Whitlock, R. M. Luton, Thomas B and John C. Gault, and F. G. Moss, to have a receiver appointed to take charge of certain stock of the Interstate Telephone and Telegraph Company. The company has a capital stock of $500,000, divided into shares of $100 each, and was organized for the purpose of manufacturing, leasing and selling telephones. One of its chief intentions was to secure the exclusive right of the invention known as the Hopkins telephone from George M. Hopkins the inventor. Charles Whitlock was one of the originators of the scheme, and he took in with him A. C. Story and A. C. Knapp. In March, 1885, John C. Gault, now the president of the company and a well-known railroad man, bought one hundred shares of the stock, and advised Reynolds to take a block also. Reynolds was finally persuaded to do so, and, he claims, put in $10,000 on Gault's assurance that the stock could not be bought for less than fifty cents on the dollar, and that he had paid that for it. Reynolds received a certificate for two hundred shares for his $10,000. Gault told him that the company's right to the Hopkins patent was no infringement on the Bell patent, and as Reynolds had known Gault for twenty years, and felt secure in his friendship and business knowledge, he put in $10,000 more, Gault investing it for him and assuring him that he

paid fifty cents on the dollar for it. Gault also told him that Whitlock, Knapp and Story would be bought out, and their management of the company would cease. Having four hundred shares of the stock, for which he had given Gault $20,000 on the latter's representation that he had paid $50 a share for it, Reynolds began to make some inquiries.

"He avers in his bill that he ascertained that instead of paying $50 a share Mr. Gault secured the stock from Whitlock, Story & Knapp for $15 a share; that John C. Gault, Whitlock, R. M. Luton, and Thomas B Gault, a brother of John C. Gault, had entered into a conspiracy to defraud him; that the sum really paid for the stock by Gault was $6,000, and that the remaining $14,000 given by Reynolds to Gau't had been appropriated by the latter to his own use or divided with Luton, Whitlock, and the two Gaults. Of the 400 shares purchased, 300 were secured from Knapp, 67 from Story, and 33 from Whitlock. Mr. Reynolds also affirms that John C. Gault did not pay $50 per share for the 100 shares he stated that he bought for himself, but that Whitlock gratuitously gave 300 shares, or 100 shares each to R. M. Luton, Thomas B. Gault, and John C. Gault, in consideration that the last named should use his influence to get the complainant into the deal. At the rate of $15 per share Reynolds should have had 1,200 shares, but he says he only received 400 and that the rest of the stock is in the names of the defendants and would be disposed of had they notice of the suit. He asks that a receiver be appointed to take charge of the stock, that the defendants be enjoined from disposing of it, and that an accounting be ordered. Judge Moran issued an injunction as prayed.

"A similar bill against Thomas B. Gault, R. M. Luton, Charles Whitlock, and F. G. Moss, the last named being secretary and keeper of the seal of the company, was filed by Robert Bines, who claims to have put money of his own and his friends into the stock at the instance of Thomas B. Gault and R. M. Luton. These two persons comprise the firm of R. M. Luton & Co. Mr. Bines says that he was prevailed on to first buy 300 shares of stock at $50 per share, for which he paid $15,000; then he was told by R M. Luton & Co. that it was necessary to buy out Allan C. Story's interest, for which Bines paid $6,375 more, securing 135 shares of Story's stock—60 shares at $50 a share, and 75 shares at $45 a share, Luton & Co in the last sale pretending to throw off their commission of $5 per share as an accommodation. Altogether Bines put in $21,375, and then discovered that the first 300 shares cost $15 a share and the other 135 shares were bought from Story for $20 per share. He claims that Luton & Co. netted on the deal $14,175, with which at less than $15 a share they bought for themselves 515 shares from Story, 700 shares from Hopkins, and 100 shares from Knapp. Luton & Co. were in this transaction acting as the agents of Bines and his friends, whom he persuaded to go into the scheme. He prays for the same relief as that asked for by Reynolds, and Judge Moran granted an injunction also on his application."

By and by, when the Department of the Interior has suggested the propriety of the suit, and the suit has been decided in favor of the complainants, and the Bell Company is smashed into impalpable powder, and the fragments are scattered to the four winds of heaven, what a lively competition there will be among telephone people. Prices will be so reduced that telephones will be as plenty as alewives in Taunton or onions in Weathersfield. Not only will every butcher and baker have his own instrument, but the scrub woman and the man who cleans the show from your door-steps will enjoy the same facility for conversation What a convenience for your wife. Instead of waiting wearily the livelong day, and wondering if that provoking creature is going to be a disappointing thing again, the madam will be rung up and notified by telephone that "Patrick is that bad the day mem. Oi couldn't be afther leavin' him alone, mem, but Oi'll be over in in the mornin', ye'll untherstand"

What a relief, too, to have the grimy little shoemaker call you up late on Saturday night to tell you that your Sunday boots are on the trees, and will be round directly in the morning in time for church; and this will permit of your calling up the patent-leather shine boy, and notifying him that your boots will not be ready for their accustomed polish until half an hour behind the usual time. The milkman will notify his customers if the train is late or the pump frozen, and the Friday "fr-r-r-esh fe-e-sh" fiend will save time by laying out his route in advance, and economize horse flesh and lung power by contracting by telephone for his entire load in advance. And oh! the inestimable blessings and the rapid advance in Christianity that will arise from the use of private lines to the pulpits of our fashionable preachers. No fresh shirt necessary—dress coats will be a superfluity—even a lazy breakfast in bed need not interfere with religious duties. While at doughnuts and coffee one can, at the same time, absorb religious instruction by telephone. It has been objected that these pious wires might sometimes get mixed with lines from Dago shops and gambling dives, and sandwich the sermon with irrelevant foot notes—perhaps make unwholesome hash of the whole discourse—but it should be remembered that long before the anticipated day, all the wires, even in New York and Philadelphia, where such interference might work most harm, all the wires—and operators too—will be underground

"Where crosses and losses we never will know,
If upward we travel or downward we go"

Telephone rentals in that blest day will be about fifty cents a year with toll service thrown in as a chromo.

The Annual Report of Superintendent Kennedy, of the New Orleans Fire Alarm Service, furnishes some details which are interesting in the matter of overhead electrical conductors.

After speaking of the necessity for reconstructing the city's wires, which have been in service for twenty-six years, he calls particular attention to the frequency of interference with these caused by the electric light wires. In one instance three of the most important boxes had to be removed for re-construction. During the interval required by repairs the entire territory from Washington Market to the U. S. Barracks was entirely out of service. On another occasion the same company's wire tore down a chimney which damaged the roof and threw down a city tripod on a second building. In addition to all this the thing went skirmishing around until communication with the lower portion of the city was cut off for nearly twenty-four hours, and out of twelve boxes, on one of the signal lines, only one reported for duty at roll call during all this time. Again the wires came in contact with both signal and alarm circuits at one of the engine houses, burning the wires and rendering the circuits useless for an entire night.

The whole thing brings up an anecdote of of a master mechanic on a railroad where two or three smash ups had occurred in quick succession: "Colonel," said he to the Superintendent, "I want a requisition for a fresh box of engineers. The last lot seems to have been badly damaged in transit."

The Western Edison Light Company has recently inaugurated plants in the West and Northwest which have some marked peculiarities worthy of note. In this State, at Rockford, a thousand-lamp central plant was put in operation on the last day of the year. The average distance of the lamps from the dynamo is about 3,000 feet. The space covered by the plant is about 1¼ miles by ½ mile. Light is furnished at one cent per hour for 16 candle-power lamps. At Minonk, which is a coal mining town, a small central station is being put in, which will include stores and dwellings, and a branch of lamps will be carried into the bowels of the earth. This will be the first application of electrical lighting for mines in this country, so far as heard from.

At Two Rivers, Wis., an isolated plant covering an area of one-half by one-quarter of a mile has just been placed by the Edison Company, which furnishes illumination for mills on opposite sides of the river, one of these being supplied through an armored cable laid in the river bed. This is a new departure, and is reported a perfect success.

Isolated plants upon which the same company are now at work, include nearly four thousand lamps scattered through this State and Wisconsin, ranging from fifty to about seven hundred lamps to a plant.

Ohio's wise men in council are coming to the front in the matter of squeezing the telephone companies. A bill was introduced in the Legislature, on the 6th, by a "Regulator" who wants rentals fixed at $3 per month, or two for $5. Toll service fifteen cents for five minutes' talk, and for each additional five minutes five cents. A penalty for infringement of $25 is embodied in one of the sections of the proposed law.

The Town of Lake Electric Light Company, whose establishment at the stock-yards, near Chicago, has lately opened up for business, is in full operation, with 123 Thomson-Houston lights, distributed through twelve of the principal packing houses, and in several private buildings of a mercantile character.

Three Ogden engines of sixty horse-power each, and four thirty-light dynamos of the Thomson-Houston variety, furnish the current. The lines are divided up into five circuits, the switchboard being arranged to permit of any necessary combination of lines.

These packing houses are, from the very nature of their uses, about as wet, slippery and foggy as it is possible to imagine. In some of the rooms the air is so overcharged with moisture as to almost entirely cut off the light rays from an arc lamp at a distance of more than a few feet. Condensation at every opening to the outer air forms huge icicles in cold weather, and dampness pervades everything; yet, with all these discouraging impediments to insulation, Mr. Brennan, the general manager of the company, has so well looked after the necessities of the case that the lights are giving the best of satisfaction everywhere, and the demands for more lights are doubling up on the management so rapidly as to require a constant increase in facilities. Mr. Brennan is an old-time telegraph constructor, was for several years superintendent of construction of the Chicago Telephone Company, and has an experience in all the requisite details of installation, which alone could insure success in such an undertaking.

There was a widespread notion everywhere that any one can put up and run an electric-light plant successfully who has some time tacked up a bell wire or a telephone circuit, or had a week or two of experience in climbing telegraph poles and stringing a No. 9 wire. The error of this assumption is growing daily more apparent, and advanced ideas of more perfect insulation are gradually being adopted by those who a year or two ago hooted the idea of any danger from an electric-light current. The world of so-called electricians, who are the constructors of lines for illuminating purposes, is gradually being schooled by experience and hard talk on the part of the instructors.

The imperfection which leads to want of uniformity in the action of electrical generators is well illustrated in the fact stated by a correspondent, who says: 'I have two dynamos in my plant, of the same manufacture, shipped to me at the same time by the same makers, and assumed to have the same capacity. One of these permits of forty-two good lights with a margin, while with the other I can run but thirty-seven lights and have no margin—a difference of more than five lights, under precisely similar circumstances, on the same line and through the same connections;" and he asks, what is the cause? Any scholar in the class may answer the conundrum.

Here is another, from a second correspondent: "Last year I could only get about thirty lights out of my sixty-light machine, and you know how thoroughly disgusted I was. After having the line properly fixed up and things generally bettered, I increased the number of lights, until now I have sixty-eight in circuit, and I think I am safe in saying I can run 100 with the same dynamo. Anyhow, I am putting them on as fast as I have orders, and shall till I reach the limit. Come and see me, and I will tell you something."

And any scholar in the class may answer this also.

Telephone stock values, as follows, are reported by S. G. Lynch, at 144 La Salle street:

Chicago	$375	@	$400
Central Union	51	@	53
Michigan	67	@	69
Iowa Union	18	@	20
Great Southern	25	@	30
Colorado	18	@	20
Rocky Mountain Bell	40	@	45
Mo. & Kas.	54	@	56
United	16	@	18
Cumberland	70	@	75
Wisconsin	110	@	112

CHICAGO, Jan. 14, 1886.

A MAGNETIC PARADOX.

215 South 5th street, PHILADELPHIA,
January 8, 1886.

Edi ors Electrical Review:

I desire to direct attention to a phenomenon which I am unable to account for, in the hope that some one of your readers may furnish an explanation.

I wound upon a tube of thin brass, about ¼ inch diameter and 1¾ inch long, some fine wire, so that the diameter of the coil was about ½ inch, and inserted it into a closely fitting tube of sheet iron, of the same length; upon making an effort to magnetize this tube, by passing a current through the coil, I found, to my surprise, that no effect was produced; yet, by the same current, a core inserted in the coil, was strongly magnetized.

In attempting to explain this, I assumed that, possibly, the opposite polarity in the axis of the core caused the magnetic tensions, induced in the tube, to complete the magnetic circle through this central field of low resistance. I therefore made the current pass in the opposite direction in the interior portion of the coil, thus inducing the same polarity in the axis of the coil as should be induced in the tube, by the exterior portion of the coil, and the above-mentioned possibility prevented; but the result was unchanged When, however, a current was passed through a wire coiled upon the outside, the tube was rendered strongly magnetic.

Why should not a current passing near the internal surface produce the same result as when passing near the external surface?

WM. B. COOPER.

The general meeting of the shareholders of the United Telephone Company of the River Plate, Limited, was held in London, Dec. 28th. Mr. F. W. Jones was very justly re-elected chairman and managing director. In the statement submitted it is shown that the financial depression which began in the Argentine Republic, in November of last year, very seriously affected prices of all kinds, and will affect the gold value of receipts during the year ending March 31st, 1886. The receipts from subscribers have, however, very largely increased, and now represent an income exceeding by a considerable amount the favorable estimates made six months ago. The general progress in the River Plate has met with no material retardation in consequence of this depression. A decided change for the better has already manifested itself, and a continued improvement in the financial situation is confidently anticipated. The privileges and concessions originally acquired by the company were considered of value as relating to all the River Plate. The territory having during the year been occupied to a considerable extent by other and competing companies, the directors recommend an acknowledgment of the fact by writing off a reasonable per centage on that account. The net revenue for the year and the amount brought forward from last balance makes £13,577 7*s.* 2*d.*, from which it is proposed to write off £11,881 14*s.* 2*d.* being 5 per cent. on plant, and 20 per cent. on privileges and concessions, carrying forward a balance of £1,695 13*s.* 0*d.*

Telephonic News

⁂ Kansas City Telephone Exchange increased 404 subscribers in 1884, 405 in 1885, and will try to make it 406 in 1886.

⁂ The Sedalia (Mo.) Telephone Exchange, which was closed last May, has just been reopened with one hundred subscribers.

⁂ In the contest in the Patent Office between Focard and Drawbaugh, to determine the question of priority of invention of the form of telephone in use in the Signal Office, the examiner has decided Drawbaugh to be the prior inventor.

⁂ The Missouri and Kansas Telephone Company have just completed a line from St. Joseph to Savannah, Mo., a distance of 13 miles, with hard drawn copper, 165 pounds to the mile, and paper insulators; it works perfectly. This line will probably be extended to the Maryville Exchange, 30 miles farther on, and thence to the Iowa State line. The same size wire and kind of insulation will be used all the way, with the expectation of getting the very best results.

⁂ There are 2,200 subscribers to the telephone exchange at Providence, R. I., which in a city of 120,000 inhabitants is probably the best proportion in any city of the United States. In this exchange there are a number of "summer" subscribers, which are discontinued every fall, but the increase during the past three months has more than made up for this, and the exchange is growing every month. The company's system in Rhode Island comprises 3,100 subscribers.

⁂ Plainfield, N. J., is somewhat excited over a contest between the city authorities and the New York and New Jersey Telephone Company. A charter was granted to the telephone company by the city on condition that it should place a telephone in each of the fire-engine houses, and in the Hook and Ladder and the Alert Hose companies' houses. Recently these telephones were removed, and now the city authorities order that no more poles or wires shall be put on the streets.

⁂ Chief Clerk Carmack, of the Girard House, Philadelphia, said that the men known as telephone cranks were continually asking permission to use the telephone. Frequently permission is granted, and, after looking through the telephone guide, the cranks often call up a dozen people and ask them all sorts of questions relating to their hobbies. There is an old crank who clings to the bar-room. He claims to own a telephone company, and every time he gets a drink he issues a certificate for one share of stock to the bar-tender. The bar-tenders own nearly all the stock.

⁂ Leavenworth, always to the forefront in matters of public spirit and enterprise in these days of rapid transit and expeditious transactions of public business among the first cities in the West, established a telephone exchange, which is part of a system which embraces some half-dozen cities above and below us in the Missouri Valley, and Lawrence and Topeka, in the Kaw River Valley. The Bell instruments are used in the system, which is in excellent condition and well managed. There are about three hundred telephones in use in the city, and the number is constantly increasing.—*Leavenworth (Kan.) Times.*

⁂ A specialist in throat troubles was called to treat a Boston lady who manifested so much interest in his surgical instruments that he explained their uses to her. "This laryngoscope," said he is fitted with small mirrors and an electric light; the interior of your throat will be seen by me as clearly as the exterior; you would be surprised to know how far down we can see with an instrument of this kind." The operation over, the lady appeared somewhat agitated. "Poor girl," said her sister, who was present; "it must have been very painful." "Oh, no, not that, not that," whispered the Boston lady, "but just as he fixed his instrument in place I remembered that I had a hole in my stocking."

⁂ The Mexicans manage to telephone quite differently from what we do. Our short, sharp and decisive style of questions and answers would not be tolerated in the land of the Montezumas. There courtesy, not business, dictates the manner of communication. The regular response from the central office to a telephone call is "Mande usted," which is equivalent to "At your command." Then preliminaries are gone through somewhat as follows: "Good morning, senorita, how do you do?" "Very well, I thank you; what service may I render you?" "Will you kindly do me the favor of enabling me to speak with Don So and-So, No 777?" "With much pleasure," etc., etc., and when the connection is made the usual polite introductions are gone through before proceeding to the business in hand. Think of an American central-office girl permitting such an exchange of taffy over the wires.

⁂ At a recent meeting of the city council of Wilmington, Del., Councilman Blake called up the ordinance regulating the height of telegraph, telephone and electric light wires. He then moved to strike out all after the enacting clause and insert in lieu thereof privisions requiring all wires to be at least nine feet above the sidewalks, and twenty feet above the roadways of the streets, on notification by the street commissioner after the passage of the ordinance. It imposes a fine of $100 for a violation of the ordinance. Mr. Blake, in response to an inquiry, said that many of the telephone wires were not more than sixteen to seventeen feet above the roadways and that some electric light wires were not above fourteen or fifteen feet. Merris Taylor moved to amend by making the ordinance effective after February 1, 1886. Mr. Blake accepted the amendment "to keep peace in the family." The ordinance as amended was passed, one gentleman voting in the negative.

⁂ In view of the suit recently instituted in the United States Court New Orleans by the Great Southern Telephone Co., (working under the Bell patents) against the Crescent City Telephone Company, it will be of interest to know that on Tuesday last in the United States Circuit Court at Louisville, Judge Barr filed a decision by consent, making perpetual the injunction recently granted the Bell Telephone Company against the Overland Telephone Company, of Lexington, Kentucky, and the Richmond Telephone Company. The complainants applied for the injunction about the first of last October, on the ground that the principle of the telephone was so fully covered by their patents that the construction of any other was an infringement. The case was not argued, but was submitted upon argument of the counsel to await the action of the United States Supreme Court in reference to a similar case in the Southern District of New York. The latter case involving the same points exactly, it was thought unnecessary to carry this case to the Supreme Court, as would otherwise have been done.

⁂ The London daily papers devote much space to a demand that all telegraph and telephone wires shall be buried. The recent snow storm—the first in five years that has so astounded Londoners—broke many overhanging wires, causing accidents and commercial delays. Three-fifths of these wires are telephone and private ones. As to the government wires, the substitution of underground for overhead wires has been gradually going on, and at the present time the department has, within the metropolitan district, about 9,000 miles of line carried in pipes to less than 1,000 stretched on poles. The wires from the General Post Office are conveyed beneath the footpaths as far as Denham, beyond Uxbridge, a distance of twenty-three miles; to Hounslow, to Hadley, near Barnet; to Bromley, in Kent, and to other places, whence they branch into open roads, following the highways or canals to the provinces. Other pipes connect with the great railways. These tubes extend below all the important city thoroughfares, the largest tubes containing 110 separate lines. Through Newgate street no fewer than 412 concealed wires run, and down Cheapside there are three pipes, each carrying over eighty. How enormous the telegraph business is there, the statistics published this morning show. On Wednesday last, the day of the snow storm, there were transmitted from one part of London to another 13,936 messages. The gross number of telegrams dealt with at the central office was 64,770. Now, doubtless, will come the same kind of discussion regarding buried wires as is going on in New York.

⁂ The announcement of the decision by the U. S. Circuit Court at Philadelphia in favor of the Bell Telephone patents as against the Overland Telephone companies caused a lively movement in Bell Telephone stock, which sold up from 174 to 179. The Court declared that "the letters patent granted to Alexander Graham Bell, March 7, 1876, and Jan. 30, 1877, are good and valid in law," and also that "the said Alexander Graham Bell was the original and first inventor of the inventions described in said several letters patent." The Bell Telephone Company has been forced to have recourse to the courts time and again within the last few years in order to protect the rights granted to it by the United States Patent Office, but in every case, without exception, the decision has invariably been in its favor. The company, as is natural, is constantly attacked; it has a monopoly of a very lucrative business, and, under the conditions which exist in this land of competition and restlessness, violent opposition to its course in maintaining its rights is to be expected, and the company expects just so much of it as a regular thing, with occasionally an extra outburst by way of variety. But the point which stands out clearly throughout this maze of opposition is that the rights of the company are invariably maintained whenever they are assailed or whenever the company finds it necessary to appear against infringers in court. The company's position is simply upon the record of the Patent Office, and its officers and stockholders are confident that this position is secure. Should the Government bring suit against the company as a result of the decision of the Secretary of the Interior, soon to be announced, the company is confident that its position, always emphasized thus far as correct, will be settled most emphatically.

Decrees Entered in the U. S. Circuit Court in Boston.

Final decrees were entered in the United States Court at Boston, in the suits of the American Bell Telephone Company *et al.* against the Baxter Overland Telephone and Telegraph Company, George W. Mears, Henry H. Mears, Francis Keyser, Morris H. Alberger, Daniel L Hutchinson, C. E Williams and the Penn Overland and Telegraph Company, Morris H. Alberger, Charles D. Middleton, E. C. Amer, F. H. Green and the Overland Telephone Company, reading as follows:

"This cause came on to be heard at the October term, 1885, of said court, and thereupon, and upon consideration thereof, it is found and hereby ordered, adjudged and decreed, that the several letters patent upon which the suit is brought, viz.: Letters patent granted to Alexander Graham Bell for an improvement in telegraphy, dated March 7, 1876, and numbered No. 174,465; and letters patent granted to said Bell for an improvement in electric telegraph, numbered No. 186,787, and dated January 30, 1877, are good and valid in law. That the said Alexander G. Bell was the original and first inventor of the inventions described in said several letters patent, Nos. 174,465 and 186,787; that the title thereto, and to the inventions described and claimed therein, are vested in the complainants, and that the defendants have infringed the fifth claim of said letters patent, No. 184,465 and the third, fifth, sixth, seventh and eighth claims of said letters patent, No. 186,787, and the exclusive rights of the complainants under the same, and it is further ordered, adjudged and decreed, the complainant waiving an account and assessment of profit and damages, and accepting a nominal sum therefor, that the defendants pay to the complainants the sum of $1 as such profits and damages and also costs taxed at the sum of $25, and that the complainants have judgment and execution therefor; and also that the defendants, and each of them, their, and each of their clerks, attorneys, agents, servants and workmen, and all others acting under or with them, be perpetually enjoined and restrained from making, selling or using the said improvements patented as aforesaid, or either of them, and that an injunction issue accordingly."

The First Telephone in Arabia Felix.

By this time no doubt the gentle Arab is fairly conversant with the telephone, but the case was different when, some half dozen years ago, two of our readers paid a visit to the Sultan of Lahej, at Al Hautah, in the province of Yemen. As a propitiatory offering to the Chief, they took with them a pair of telephones and about a hundred yards of wire, which they ran up between the courtyard of the Mud Palace and the Council Chamber, in which latter some twenty headmen were squatting in company with their master. The first whisper that came through the telephone had the effect of sending them all scuttling away like a swarm of land crabs on the approach of an invader; but they were eventually soothed and brought back again. The Sultan, at first highly interested in the "little foreign talking devil," at length grew tired, and complained that it did not speak Arabic. He was assured that it spoke all languages, and in proof thereof a polyglot individual was taken to the other end of the line and made to chant the praises of his Highness in a cresendo, which ran the gamut of the thirty-nine dialects of Arabia. Before, however, the telephone had a chance of properly vindicating its character the Council Chamber was cleared; even the dignity of the Sultan being unable to withstand *too* much magic.—*London Electrician.*

The Manager of the Exchange Thinks that People Who Talk by Wire Should Pay for the Privilege.

Mr. Eliot W. Caldwell, the enterprising manager of the Southern Bell Telephone Company, of Charleston, S C., comes to the point with the following letter to the Charleston *News:*

"I desire to call the attention of your readers to a subject upon which there appears to be an incorrect public sentiment, namely, the use of the telephone by persons who are not 'subscribers,' and who pay nothing for such use.

"There are numbers of most respectable people who would never think of attempting to ride in a horse car or railroad car without paying, or at the regular expense of a neighbor, who would repel as an insult the suggestion that it was unnecessary to take the newspaper because they could borrow one, who yet, will time and again, say to a friend 'let me use your telephone,' and suit the action to the word, in many cases repeating the operation so often that the little preliminary request comes to be a superfluous formality, and is dropped.

"Now, these good people undoubtedly make a distinction in their own minds, perhaps unconsciously, between the street-car service and the telephone service, and think that it is quite proper to make unlimited free use of the latter. If they did not think so I assume that as law-abiding, self-respecting citizens they would no sooner think of 'sponging' telephone talks than they would of surreptitiously appropriating free horse-car rides or daily newspapers.

"It is on this point that the public mind needs education and enlightenment, and I would beg your readers to give the subject the candid consideration which it deserves.

"The telephone plant costs the company a heavy outlay, just as the plant of the street

railway or newspaper costs the respective concerns engaged in these branches of enterprise and public service. There is also a perpetual outlay for the maintenance of the plant and performance of the necessary current operations of the telephone service, just as there is in the other two lines of business which are mentioned as convenient illustrations; others might be named. Manifestly the money involved in the latter enterprises is invested not as a gratuitous charity, but for the use and benefit of the public just so far as there is a public demand and payment made for such use and benefit, and no one thinks for a moment of questioning the propriety of these conditions.

The telephone exchange is just as much and just as legitimate a business enterprise as either of the others. Is there any reason why the telephone company should be asked to be more of a charitable institution than the others? I am sure if our citizens will give the matter a moment's reflection they will either pay, or else they will not talk by telephone at the expense of the company and their neighbors. Such a course would greatly diminish the unrequited labor and expense of the telephone company and obviate the necessity of a subscriber's giving up his telephone because he is annoyed by demands for its gratuitous use, or of giving it up because he finds that by complying with his contract and refusing such demands he offends customers. Both of these classes have examples within our experience.

"I appeal to the good sense and fairness of the public for justice."

The Western Union Company Makes a Proposition to the City Councils of Philadelphia.

Dr. Green, President of the Western Union Telegraph Company, has submitted to the Electrical Committee of City Councils an interesting letter, in which he said:

"Desiring to meet all reasonable demands of the city of Philadelphia, this company would like to commence and complete putting the wires under ground from the main office at Broad and Market sts., and the principal branch office at Third and Chestnut sts., at the earliest period practicable. If the city authorities will give us permission to open the ditch on an eligible route for such purpose, without attaching the onerous requirements to which objection was made in my communication to the Mayor and Councils respecting the last ordinance, we will commence the work in the coming spring, as soon as the frost of the winter is sufficiently out of the ground, and complete the work as rapidly as possible. We are willing the city shall place in our ditch, in form of cable or in separate tube, the city wires for their telephone, police and fire-alarm service, not exceeding twenty wires, in order that the city may fully test their success; and will remove the overhead wires as soon as the success of the underground working is sufficiently established to render it safe to the public service to dispense with them.

"We have never thought it safe to rely solely on underground wires until they have worked successfully for twelve months. But we shall be governed in that, in a good measure, by the judgment of your own City Superintendent of Electric Wires as to when he shall feel that the lives and property of your citizens will be safe to rely on the wires underground and shall take down the city line on the opposite side of Market street from ours.

"We think it would be better for the city and for us to run the underground wires down Sansom, Walnut, or Market street, rather than down Chestnut, for reasons that will suggest themselves to the committee. We desire to place pneumatic tubes as well as insulated wires in our ditch, and these, with the place offered to the city, will occupy so much space that we should not think it prudent to place any other electrical wires in that ditch. The line proposed embraces the largest aggregation of wires, and therefore the most objectionable section of our overhead wires in the city. When that is completed and made a success, we can fix a period when we will undertake to extend the underground wires eastward to the Delaware and westward to the Schuylkill.

"Whilst this company is advised that it has the right to maintain its overhead wires, both under State and Federal laws, we protest that we have not assumed a defiant position or shown any want of respect for the order of Councils. We cannot place the wires under ground without having obtained a place to put them, and no place has been assigned us except in an ordinance conditioned that we should surrender all our rights and franchises to the discretion of City Councils. More than a year ago we had arranged with a local company having the license to use it for a larger system of the Brooks underground wires, but that company has never been able to obtain authority to open the streets and lay their wires. We protest against the injustice of denouncing us for not doing that which it is impossible for us to do, and against the further injustice of singling out this company and requiring it to say what it proposes to do, whilst several rival telegraph companies, having more or less overhead wires, are left undisturbed, and never complained of. Why are they not required to say what they purpose doing?"

The communication will be printed and considered at a future meeting. The Baltimore & Ohio, the Postal, and Bankers and Merchants' Telegraph Companies, and the Bell Telephone Company were requested to answer why they had not placed their wires underground.

Mr. Etting submitted an ordinance prepared by City Solicitor Warwick, which declared all poles erected, and the erection hereafter of poles for telegraph, telephone, or electric-light wires in or upon any of the streets, alleys, roads or highways of the city, except for city purposes, a public nuisance, the penalty for which is placed at $100 for each offence.

Primary Batteries.

1419 F street, WASHINGTON, D. C.,
January 3, 1886.

Editors Electrical Review:

SIRS—In your paper of December 26th was an article by Dr. Van der Weyde on galvanic batteries, in which he calls attention to the comparative cost of a zinc and acid *versus* a coal and oxygen combustion, for the production of "magnetic energy," the first being costly and the second cheap.

In your number of January 2d, now before me, on the second page, a gentleman of San Francisco is made to say that "there is a system of generating which is called "thermo-electricity," direct from the coal, which is now being experimented with in the East; but the loss amounts to about 300 per cent." This requires some explanation. If the loss is 300 per cent., what is left?

I have given this subject, viz., primary batteries, a great deal of thought, for many years. Long ago I discovered that the answer to the question, "Where does energy come from?" "Why, it is chemical action," would not pass muster.

I found that the cause was combustion.

The result of my observations and experiments have led me to this: That *all* the energy residing in coal and other combustible substances, can be collected, and set to work this wise. As to coal—I put coal in a grate, and set it on fire; I arrange an apparatus between the grate and the chimney, in which the energy is retained and thence conducted to work. Beside the energy obtained, the *carbon* in the coal, which goes from the grate as carbonic oxide gas, is arrested, and retained in the apparatus, and, of course, is pure carbon, worth from three to ten times as much as the coal costs.

This apparatus, if attached to a lime-kiln, would save carbon enough to exceed ten times the value of the calcined limestone. (Comp. of Carb. of Lime, calcium, 56; carbon, 44.)

I have applied for a patent, and shall introduce it as soon as I can. I shall build an apparatus, and invite the world to examine.

The reason I sent you the inclosed question to be answered, is, I want to get the opinion of others about the combustion of water, as I am assured that the decomposition of water, in any way, is combustion.

The evaporation, or drying, or boiling of water, is just as much combustion as the burning of coal or wood is. There is no difference; in both cases it is destroying the cohesion of the elements contained in them.

If you reply to the question per books, in your paper, I will send you another version, that is not in books.

Very respectfully,
JOHN CORSON.

Requirements of the Canadian Patent Law in Respect to Manufacture of Patented Articles.

The Bell telephone patents having been declared invalid in Canada for the reason that they had not been manufactured in accordance with law, a suit was lately brought to upset the Edison telephone patents on the same ground. The Minister of Agriculture has, however, decided that in the case of the Edison patents the law has been complied with, and the patents stand. He says:

"A patentee is within the meaning of the law, in regard to his obligation to manufacture, when he has kept himself ready either to furnish the patented article or to sell the right of using, though, may be, not one single specimen of the article has been produced, and he may have voided his patent by refusing to sell, although his patents were in general use.

"In this case there is absence of the proof, without which no patent should be considered forfeited.

"Therefore, Thomas Alva Edison's Patents No. 8,026, for telephonic communication, No. 9,922 for improvements in telephones, and No 9,923 for improvements in telephones and circuits, have not become null and void under the provisions of Section 28 of the Patent Act of 1872."

.... January 15th the Electrical Supply Company moved its Chicago office from 175 and 177 Lake street to 171 Randolph, the increase of business compelling that more extensive offices and warerooms be secured. Mr. F. S. Terry, the manager of the Chicago house, is doing splendid work for his company all over the West.

.... The Police Signal system of the Municipal Signal Company, of Boston, the invention of Mr. Jno. C. Wilson, was exhibited in the Council Chamber to the councilmen of Boston and others recently. Since then the system has been selected by the Police Commissioners for trial, and Station 6, South Boston is being equipped.

.... Last week saw the completion of an independent wire along the line of the R. W. & O. road from Oswego to Watertown, N. Y. It will be continued to Ogdensburg in the spring. Weed Bros. of Mexico, are the contractors. Heretofore the road has been using the Westeen Union and Great Northwestern telegraph company's wires, and now expects to receive a great benefit from its own wire, which is well constructed.

.... The new lines of the Michigan Postal Telegraph Company are now being strung from Detroit to interior portions of the State. The company now have poles set from Detroit to East Saginaw and Bay City, also to Jackson and nearly to Lansing, and have started the work of stringing wires on them. They expect to be open to the points named and intermediate places within a month. Then, if the weather permits further building, they will extend the Lansing line to Ionia and Grand Rapids and build to Port Huron this winter.

.... The usual printed instructions for the preparation of the chromic acid solution for batteries direct that the sulphuric acid be poured into *hot* solution of potassium dichromate; unless this be carefully done, small portions of the oil of vitriol may be projected into the face of the operator. Bunsen's method is preferable; mix the dichromate, in granular form, with the sulphuric acid, then add *cold* water, with continued stirring; the union of the acid and water generates sufficient heat to speedily effect the solution of the salt.

TELEGRAPHIC

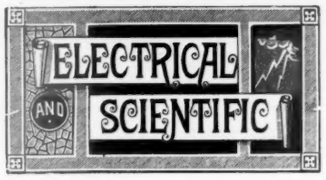
... The American District Telegraph and Messenger Company, of Lincoln, Neb., although a new organization, is succeeding finely.

.... Where it appears that there has been a delay in transmitting a message, the burden of explaining the delay is cast upon the telegraph company. The contributory negligence of the sender of a message will defeat an action by him to recover the statutory penalty for negligence in failure to transmit. Where the sender of a message is asked to give the Christian name of the person to whom the message is sent, and the number of her residence, but replies that it is unnecessary, and directs the message to be sent without such name and number, he is guilty of contributory negligence.—*Western Union Telegraph Company* vs. *McDaniel, Ind. N. W. Rep.*

.... According to an official circular recently issued, the following are the quantities of materials to be used in charging the following descriptions of batteries used in Government departments: Bichromates, 4 oz. of bichromate of potass and 4 oz. of sulphuric acid in the outer cell, and in the porous pot 2 oz. of mercury with a small quantity of sulphuric acid, varying according to the porosity of the cell, but in no case to exceed ¼ oz. Large Daniells: 5 oz. of sulphate of copper. Small Daniells, 2½ oz. of sulphate of copper. Large Chambers: 3 oz. of sulphate of copper. Agglomerate and No. 1 p.p. Leclanche: 4 oz. of sal-ammoniac. No. 3 p p. Leclanche: 2 oz. of sal-ammoniac.

.... B. L. Allen has just placed thirty of his still-alarm boxes in different parts of the town of Pawtucket, Mass., and yesterday afternoon, says a local paper, he invited the town officials and people generally to see them tested. Consequently a big crowd was in attendance, and Ben, the central figure, was regarded as much of a hero as is the presiding elder at a Methodist camp-meeting. The box on the Woodbine was the location for the test, and a call for a policeman brought Officer McLoughlin running to the spot in 1 minute 14 seconds from the police station. A call for a messenger boy secured one in 18 seconds; another call for a policeman brought Officer Hackett in 1 minute. A call for the Fire Department was then sent in, and Hose No. 2 came rushing in in 1 minute 15 seconds, followed by No. 3, 4 seconds later. This closed the test, which was perfectly satisfactory, and his alarm was pronounced a success. It has since been adopted by the city of Pawtucket.

.... "I will tell you an incident connected with telegraphing by sound," said the telegraph operator. "After I came to New York I lived in a quiet street, which is now a noisy thoroughfare. I spent most of my time when away from the office in my room. One evening while sitting at my window I happened to look across in the opposite house, where I saw a pretty girl at one of the windows. She was leaning again the casement tapping on the glass with a pencil. After this I saw her at the same place many times. We had got as far as a nodding acquaintance, but I had no opportunity of speaking to her. One afternoon, having come home somewhat early, I was seated at my window thinking of my pretty friend opposite. I almost unconsciously tapped a salute to her on the window pane with my pencil, using the telegraphic signs. I was very much surprised when a reply came from her in the same way. She understood the signs and could use them. After that we had long talks across the street, and as our interest deepened into a warmer feeling many a tender message was sent by the air line. You may not believe it, but we were engaged to be married before we had ever exchanged a word, or before either had heard the other speak a word. Afterward I was introduced properly, and married the young lady the following Christmas, and that is what I call getting a wife 'on tick.'"



There is a land of bitter fears and wailing,
A land most like that drear one Dante knew,
Where wan-faced Niobe, with dark robes trailing,
In sad procession moves, brows bound with rue.
It is a land peopled by witless mortals,
Compared with whom the virgins five were wise—
And there is writ above its gloomy portals:
"We did not think it paid to advertise."

There is a land that flows with milk and honey,
Not the condensed, nor yet the sorghum strains,
Each dweller bears a gripsack fat with money,
Bonds, coupons, stocks, and various other gains;
Happy are these as, at high tide, the fishes,
No tear doth drown the laughter in their eyes;
For better luck they have no sort of wishes;
The cake is theirs; they learned to advertise.

* * At a recent meeting of the Royal Microscopical Society, Mr. J. Mayall, Jr., exhibited the Helot-Trouve electric photophore, which had been recommended as an excellent illuminant for microscopical purposes.

* * An English exchange says: "One of the most attractive of the sciences, and one with which we have necessarily much in common, is chemistry. We know of nothing more refreshing after a hard day's work than to relax the mind with a dreamy reflection upon, say, the derivatives of Metanitrobenzenylamidoxime and Metanitrobenzylazoximebenzonyl, or upon the properties of Phenoxydiphenylmethylphosphonium iodide $PMe\,Ph_2\,I.\,OPh$; the OPh being kept prominently in view. Truly we have much to be thankful for.

* * The first annual meeting of the Jackson Electric Company, for the manufacture of electric motors was held at Portland, Me., Tuesday. The following were elected directors: A. V. Bugbee, D. F. Robinson, A. W. Allyn, E. N. Harris, Geo. S. Williams, C. W. Hatch, Charles M. Martin, C. A. Jackson, Lawrence; Frank P. Hobbs, Wolfboro. A. V. Bugbee was elected president. The rest of the officers will be elected Saturday afternoon at the office of A. W. Allyn, Lowell street, at 4.30 o'clock. The stock in this company is non-assessable.

* * M. G. Ligner has made a remarkable communication to the Meteorological Society of Austria. He has ascertained after a number of careful experiments that the moon has an influence upon a magnetized needle varying with its phases and its declination. The phenomenon is said to be more prominently noticeable when our satellite is near the earth, and to be very marked when she is passing from the full to her first or second quarter. The disturbances are at their maximum when the moon is in the plane of the equator, and are greater during the southern than the northern declination.

* * The manufacturers of the country have been more than usually fortunate during the past year in the matter of boiler explosions. Few very destructive ones have occurred, and the loss of life has been unusually light. The iron manufacturers have been especially fortunate. We note also almost an entire absence of these terrible disasters on our western river steamers. It is to be hoped that this year will not prove an exceptional one in this respect. Let us hope that the record will be better and better with each succeeding year. This will surely be so, if those in charge of steam plants exercise the requisite prudence, and educate themselves in their important specialty.

* * Charles B. Perkins, ex-manager of the Holyoke Telephone Exchange, was arrested last Saturday on a charge of embezzlement and grand larceny preferred by the New England Telephone Company. Since his discharge on Jan. 1, when office expenses had to be reduced, a collector in making collections found many subscribers who showed him receipts that were not entered on the books. The company's auditor has been investigating the matter. Perkins had been missing, but returned very quietly Saturday, and after some trouble was found and arrested. He had nothing to say and no cause is assigned for his action. He will be arraigned in the Holyoke Police Court and may compromise the case.

* * It is unfortunately true that there has been in the past, a great deal of superstition in the make-up of the ordinary engineer. Various fallacies have obtained so firm a foothold in their belief that many precautions that would otherwise have been taken, have been neglected. These fallacies and superstitions have generally taken the form of some theory of explosion over the conditions of which man had no control. We are glad to see that this is passing away, and that the fact is beginning to be recognized that boiler explosions, like all other accidents, are *always* due to defective material, weak construction, ordinary deterioration, or carelessness in management. When these facts become generally recognized, then and only then can we look for effective precautions to be taken to prevent them.

* * Mr. Secor's electric yacht Eureka is still lying at the yard of her builders, Messrs. C. & R. Poillon, foot of Bridge street, Brooklyn, and is nearly ready for a trial of her machinery. Her boiler and tanks have been filled. Mr. Secor said that all that he was waiting for now was a copper pipe which forms one of her connections, and he did not think that this could be put in place in less than a week. "So much has been printed about her," said he, "that we are very anxious that there shall be no hitch of any kind when we do make our first trial, and we prefer to spend some little time in perfecting all the arrangements as far as possible. We have a little stove below to provide heat for the workmen and to prevent the water freezing in the pipes, and the pipe from this stove leads into the funnel. The smoke from this, when lighting the fire, passing out of the funnel, has given rise to the report that we have already tried her, but this is a mistake. We have never yet had the furnace fires lighted, nor can we, until we get this pipe in place that I spoke about. I have been much amused at some of the articles which have been printed about the boat. One writer a week ago, pretending to give our plan in detail, said that it was a feasible one, but that our application of it was defective, and criticised our valve arrangement. He evidently had written an article from an inspection of our patent drawings, which, of course, any one can obtain for 25 cents, but every one who is conversant with the subject knows that in applying for a patent a certain kind of valve for instance described, with the addition of some other valve, so as to cover all descriptions and prevent infringements. When those drawings were made, not a single working drawing had been begun, and the valves which we actually are using are no more like those patent drawings than an apple is like an oyster. However, I take no notice of their communications, for if the boat is a success they amount to nothing, and if she fails it is hardly worth while inquiring why."

Otto *vs.* Steel.

(Abstract from English Journals.

The important case of Otto *vs.* Steel which has been fought for sixteen years before Mr. Justice Pearson in the Chancery Division of the High Court of Justice, London (England), ended on December 19th, with judgment for the plaintiff. There was a formidable array of counsel and scientific witnesses for the prosecution, consisting of five lawyers and three scientific witnesses, and the other side was also ably represented. The point at issue was the validity of Dr. Otto's patent of 1876, which was strongly contended for already in Otto *vs.* Linford some years ago, and then decided in favor of the well-known inventor. The defendant admitted that his engine was an infringement of the "Otto" patent, and if it were valid he was liable under the statute. The defendant sought to invalidate the first claim on particulars of objections not dealt with in the former case *v.* Linford. From the plain evidence furnished by the scientific witnesses the judge decided that the first claim is strictly accurate according to Dr. Otto's specification. He also concluded that the mixture, when fired, is as specified by Dr. Otto, and has exactly the effect which he describes in his first claim; that his invention has not been anticipated by any of the specifications which have been put in before him, and that therefore Dr. Otto's patent is a valid and good patent.

The defendant was given one month, within which his engines should be given up. A petition for having the injunction suspended for a longer term was refused on the ground that this action was the second in which the court had declared in favor of the patent.

Gas Engine Patents.

The result of the case of Otto *vs.* Steel has probably put an end to the hopes, for the time being, of many inventive minds and enterprising manufacturers, who would fain have produced a gas engine that should be as good as that of Otto, without being precisely similar. Messrs. Green, of Leeds, thought they had constructed such an engine, upon the specification of Mr. Robert Steel, but they have now learnt otherwise from the lips of Mr. Justice Pearson, and there is nought for them but to submit—unless, indeed, they are so confident that there is an essential difference between their engines and the Otto that they are resolved to consult a yet higher tribunal. When the French courts declared a few months ago that the Lenoir engine was not an infringement of the Otto patents, and that Otto had been anticipated in several respects by Boulton, Beau de Rochas, and others, no doubt many of the English manufacturers thought, as we did, that there was a strong probability in favor of a similar result attending any litigation which might arise in this country. The fates, and Mr. Justice Pearson, however, have decided otherwise, and Otto has triumphed.

Defeated in regard to gas, inventors might now with advantage turn their attention to the development and perfection of the petroleum engine. And by this we do not mean an engine in which oil is burnt direct as fuel, but one in which oil is employed as in such prime motors as the Eteve engine, where a fine spray of the liquid is injected into the cylinder with air under slight pressure, the resultant mixture being highly explosive and easily ignited by means of a spark from an induction coil or by a flame, as in the Otto engines. We have ourselves seen during the last year two distinct types of motors working upon this principle, both of which are ready for commercial application, and the working cost of which would probably be but one-half that of gas. Of course, such engines can not only compete with steam and gas motors on their own ground, but they are also available where neither steam nor gas can be readily obtained, and where, indeed, both are absolutely unobtainable. It must not be thought that we are speaking of apparatus which is only in the experimental stage; one of the two engines to which we have above referred is constructed in types varying from 1 to 40 or 50 horse-power, and is capable of immediate practical application.—*London Electrical Review.*

Temperature of Water.

1419 F street, WASHINGTON, D. C.,
January 3, 1886.

Editors Electrical Review:

SIRS—Will you kindly answer the following question, through your columns:

Why does not water get a higher temperature than the boiling point, 212°, at the sea level?

Perhaps some of your numerous readers can assist me; if so, I should be glad to hear from them.

JOHN CORSON.

—— Another dynamo has been ordered for the isolated incandescent plant at the Bates House, Indianapolis, Lawrence & Herkner, of this city, furnishing the additional belting.

The American Electric Illuminating Company.

The rapidity with which electric lighting is superseding the use of gas is well shown by the incorporation of ten electric illuminating companies which are to operate the American system of electric lighting. Papers incorporating these companies were filed last Saturday in the offices of the County Clerks of this city and Albany. The corporations, designation and capital are as follows:

American Illuminating Company of New York, capital	$300,000
Do. Brooklyn, capital	100,000
Do. Harlem, capital	100 000
Do. Yonkers, capital	30,000
Do. Long Island City, capital	30,000
Do. Newburgh, capital	30,000
Do. Cohoes, capital	30,000
Do. Syracuse, capital	30,000
Do. Watertown, capital	30,000
Do. Ogdensburg; capital	30,000

The incorporators and trustees of these companies are as follows:

The Hon L. M. Bates, of Bates, Reed & Cooley, New York; Col. F. R. Hain, general manager Manhattan Elevated Railroad, New York; Senator John J. Kiernan, New York; Samuel H. Willard, vice-president and treasurer Holmes, Booth and Haydens Company, New York; Henry C. Adams, New York, agent for Holmes, Booth & Haydens Company; A. B. Chandler, Mackay-Bennett Telegraph Combination, New York; the Hon. H. S. Hyde, president of the Agawam National Bank, Springfield Mass.; H. P. Frost, general manager of the Southern New England Telegraph Company, New Haven, Conn.; Edward H. Goff, president of the American Electric Manufacturing Company, New York.

Mr. Bates will become president of the new corporation during the construction of the plants by the American Company. This system of electric lighting, under the able management of President Goff, will surely secure its full share of business.

Producing Cane Sugar from Starch by Electricity.

This method, due to L. Aubert and V. Giraud, of Lyons, depends upon the formation of saccharose from starch and water by a practical method, which is substantially as follows:

100 kilograms of potatoes are heated to 100° C. in 5 cubic meters of water, with 5 kilograms of sulphuric acid, and a trace of nitric acid, until the starch is dissolved. An electric current of 11 amperes is then passed through the solution between electrodes of antimonial lead, the direction of the current being changed at intervals. In about two hours' time the solution is tested with tincture of iodine and alcohol, and if no coloration or precipitate is produced the current is interrupted, and carbonate of lime and hydrate of lime, the latter in considerable excess, are added to remove dextrine and unchanged glucose. Previously to filtration and saturation of the lime with carbonic acid, some basic acetate of lead is added to remove the coloring matter, which otherwise would interfere with the crystallization. After concentration of the liquid in the usual way, the syrup is allowed to crystallize, which, however, takes somewhat longer than ordinary sugar-syrup.

Annual Meeting of the Electric Light Association.

At a meeting of the Executive Committee of the National Electric Light Association, held in New York, it was

RESOLVED, That a general meeting of the National Electric Light Association be held at the Carrollton Hotel, Baltimore, at noon on the 10th day of Feb. next, and to continue from day to day until such business as may be presented shall be properly disposed of; also,

RESOLVED, That invitations be sent to all companies and persons eligible under the constitution, who are not already members, to become so at once.

To fully explain the qualifications necessary to become a member, either as associate or active, I beg to quote the following extracts from the constitution of the National Electric Light Association :

Article Second.—Members of this Association shall be companies, firms, or individuals, operating electric plants or manufacturing electric light apparatus.

Article Eight.—The entrance fee shall be ten dollars, and the annual dues shall be ten dollars for each member.

Under these provisions you are cordially invited to join the Association, and, should you accept, please notify the undersigned, enclosing your draft or check for ten dollars, payable to the order of Chas. Cooper, Esq., treasurer. By return mail you will receive a receipt, which will be your credentials, admitting you to the convention to be held in Baltimore Feb. 10th, 1886.

You are requested to send to the undersigned a list of subjects which you wish to suggest for discussion at the convention.

Yours very truly,

J. F. MORRISON,
Pres't National Electric Light Ass'n.

—— The Nashua Iron and Steel Company have just completed a shaft for the steamer City of Cambridge, of the Boston and Bangor Line, which weighed ten tons as it came from the hammer. Some idea of the facilities possessed by the firm may be known when it is stated that the shaft was made in seven days, of ten hours each. They have two furnaces, and while their work was going on, they also made fine steel billets, averaging 5,000 lbs. each. Their buildings are lighted by the Brush electric light throughout, and during the last six months everything has been thoroughly overhauled and refitted.

—— The circuit proposed by the committee at Burlington, Iowa, in their location of the electric lights will be about eight and one-half miles in length. The circuitous course the line will follow, and the frequent doublings upon its own track, add greatly to its extent. The heavy insulated copper wire employed to conduct the current, costs something like $150 a mile. Then comes the added expense of poles, brackets and insulators, and the labor of building the line, the total expense of which, it is estimated, will amount to something near $3,000. Another engine and dynamo will also be required to operate the new circuit.

—— Hon. James T. Brashear, mayor of Madison, and the members of the council and the city officers, arrived in the city last night to investigate the operations of the Jenney electric light, and under the care of Alderman Rorison, who is secretary of the company, they inspected the light in operation in West Indianapolis, and expressed themselves as greatly pleased with it. They propose to establish fifty electric lights, of 2,000 candle-power each, in Madison, and will probably make the necessary arrangements with the Jenney Company. They are visiting various points of interest in the city to-day.—*Indianapolis News.*

—— "When all the electric lighting appliances are completed for the Albany capitol," said Superintendent F. P. Little, of the United States Electric Light Company, "the building will be the most extensively and brilliantly lighted in the world. The capitol will take 4,000 incandescent lights, representing 64 000 candle-power; 100 arc lamps of 2,000 candle-power each, and 25 mogel lamps each on the Senate and West-end staircases, of 125 candle-power each. To run the incandescent lights will take seven dynamos, aggregating 600 horse-power, and one 20 and one 50 horse-power dynamos to run the arc lights. No isolated plant exists in the world so large as the one the capitol will contain, when the building is finished."

—— The Harris-Corliss Engine Works at Providence, R. I., have been well employed throughout the year. They have run full time right along, with about two months running night and day, and have been shut down but two days, and then to connect up a larger engine to replace the old one that has been in service for years. The prices of engines have fallen off, and the company has been forced to make reductions of upwards of 20 per cent. off previous prices; the wages of their employes have not, however, been reduced over 4 per cent. on the average. During the year 51 orders for engines have been filled, equal to 8,402 indicated horse-power, or to 51 twenty by forty-eight-inch engines, making 68 revolutions per minute. Twenty-nine orders were taken from January to July, amounting to 5,506 horse-power, and 22 orders, amounting to 2,896 horse-power, during the last half of the year.—*Providence Journal.*

—— The first of the year the city of Raleigh was again electrically illuminated, to the great satisfaction of every one on the streets. For over a fortnight, ever since the disastrous break-down of the engine at the car company's shops, the lights had been cut off. One morning, while the machinery of the car company was in full operation, the cylinder head blew out and the powerful and handsome engine of 100 horse-power was a wreck. There were tedious delays in securing repairs, annoying and costly to the car company, as no work could be done there and the dynamos could not be driven. The lights were reported very brilliant. The three lights in the capitol square appear to illuminate all parts of the square, as far as a casual examination showed. The light will no longer be used on top of the capitol. A number of lights have been put in various stores, etc., since the break-down. The electric light company is in no wise responsible for the delay.

—— At Youngstown, Ohio, several years ago, the question of having the city lighted with electric light was broached, and since then the matter has occupied a large share of the attention of each council. After a lively contest the contract was recently awarded the Thomson-Houston Co. Their proposition, which was accepted, was to furnish 125 arc lights, each of 2,000 candle-power, and to light the city for one year for $7,750. As yet the Thomson-Houston Company have not signified their intention of signing the contract, and it is claimed by some that they will not take the risk of losing a considerable amount. It is estimated that it will cost $30,000 to erect the plant ready for lighting the city, and under the action of Council they are only given the contract for one year. If at the end of that time the gas company should make a low bid and secure the contract it would leave the Thompson-Houston Company out in the cold. Unless the latter company, within thirty days from December 21, notifies Council of its acceptance of the contract, the action taken will be rescinded.

—— The Troy, N. Y., *Standard* believes in the electric-light. It says:

"If the entire city is illuminated with the electric light, the cost to the taxpayers will be considerably in excess of the cost of gas illumination. But it is doubtful if the additional cost will be burdensome. A well-lighted city is a well policed city. The more light we have the fewer footpads. The people who inhabit the suburbs have been complaining for years that, although they are called upon to pay for the support of the police force, it is only on rare occasions they catch a glimpse of a policeman. It is not possible, with the number of officers now on the force, to supply adequate protection for the outlying wards. Put plenty of electric lights in the suburbs, and we can get along without materially increasing the number of our patrolmen. Every electric-light pole, with its blazing crown, will stand as a guardian of the lives and property of our citizens. Another thing to be considered is the number of men to whom the electric light extended throughout the city, would afford employment. It would be virtually the creation in our midst of a new industry with all its attendant benefits to the community. There is no use in being penny wise. Let us have more light."

—— The Mayor of Troy, N. Y., has sent a communication to the Common Council on the subject of lighting the entire city by electricity. Figures and information concerning the cost of the scheme are being collected and the working and expense of the system in other cities will be fully considered before a contract is made for the coming year. The electric light company will not accept a contract at last year's price, 36 cents per lamp, and it is believed will insist on 45 cents per lamp which is the average cost in other places. At 45 cents per lamp, for 350 lamps, burning regularly all the year round, the cost would be $57,487.50 and if the 100 additional lamps conditionally provided for in the specifications presented to the contracting board yesterday are included, the expense will be $16,435 more, or a grand total of $73,922.50 a year. The cost of gas the past year, the city engineer says, was about $22,000. At present there are 150 electric lights in use, which at 36 cents a light of course come cheap enough, but that is only the germ of the system. To-day by order of the city engineer 78 gas lamps were shut off on the Greenbush highway, Mill street, River street, Adams street, Second street, Stowe avenue, Water street, Tyler street, and the alleys on the circuit, electric light having taken their place. 75 cents per lamp per night would be nearer the right figure for the amount of candle-power furnished.

—— Mr. C. C. Warren, manager of the United States Electric Light of Chicago says: "My attention has been called to the publication of several letters in the daily press of the city, signed 'A Citizen,' 'A Taxpayer,' etc., regarding the lighting of the county buildings by the United States Electric Lighting Company. As these letters have evidently been written by one of our disappointed competitors, and as they seem exceedingly nervous over the successful completion of the largest plants ever installed in the country, I have thought it wise to give the information asked regarding wiring, etc, in order to save the d. c. a severe fit of sickness. Great stress has been made in the comparison of wiring and fixtures as between the city hall and the county buildings. The chandeliers in the city hall were originally constructed with a view to their utilization as electroliers, or what are termed combination fixtures, while the gas-fixtures throughout the county building were of the old style. The city's electrician, with a foresight that does him credit, arranged all the little details in the city hall so important to the workman, and through the same valuable aid and experience our friends on Dearborn street were enabled to light up the one or two stories of the city hall that 'refused to go' for several weeks after the rest of the building was lighted. Of course tastes differ as to the color of the light; while perhaps some people would prefer the yellow of the city hall lights, many others would decide in favor of the pure white of the county buildings. Concerning any difference of opinion between the company I have the honor to represent and the county, the d. c. before mentioned is referred to President Klehm, who has gone over the entire matter and is fully posted. His address is the county commissioners' room at the court-house. In a company of the magnitude of the United States Electric Lighting Company, whose business the past year has been unprecedentedly large, the hundreds of men engaged in wiring, etc., are as carefully looked after as is possible in any systematized business. That a foot or two of wire is visible in so large a building as the court-house was perhaps unavoidable. President Klehm, we think, is satisfied that the county's interests will be fully protected in the matter of carrying out our contract in every particular. I have no doubt that the mortification felt over the fact that only six lamps per horse-power can be given instead of ten, as our people guarantee, inspires much of this jaundicy feeling. If anyone knows of a successful system of electrical lighting that depends entirely upon the 'eminent respectability' of its board of directors, a chromo is ready for him." Mr. Warren has shown good judgment and great enterprise in the judicious management of his company's interests at Chicago.

ELECTRIC LIGHT NEWS

—— Contracts for lighting the city of Sacramento by electricity have just been awarded to the Thomson-Houston Company.

—— The Woburn Electric Light Company, which began lighting places of business last July, had on the first of this month over 800 lamps burning, with orders ahead to fill.

—— The Pond Engineering Company of St. Louis, Mo., have just put in their steam plants for electric lighting at Des Moines and Davenport, Iowa, and Greeley, Col. This firm under the management of the well-known engineer and contractor, Mr. Frank H. Pond, are doing a large business in the electric lighting field.

—— At New Haven it has been proposed to place an electric light on the most rough-infested corner as a means of protection. When the gang heard of it, a session was held at which it was resolved that should a light be placed there, they would tear it down. Thugs and thieves are greatly opposed to the electric light.

—— Manager F. A. French of the Hartford Electric Light Company was on New Year's Eve presented by his employees with a very elegant gold-headed, appropriately inscribed, ebony cane. The gift was a great surprise to Mr. French who came down to the Central Station in response to a telephone message that he was needed to settle a little difference between "the boys." He settled it.

—— That part of Chicago in which the new board of trade building is situated, was suddenly illuminated at 5.30 last Saturday by a corona of electric lamps about the top of the tower of the Board of Trade building, 312 feet above the street level The plant is of 40,000 candle-power, said to be the largest mass of electric light and at the greatest altitude of any in the world. The engine furnishing the power will be started at dark every evening and run till daylight.

—— A peculiar and rather dangerous kind of malicious mischief is being practiced by persons unknown in the city of New Orleans. It is the cutting of the wires of the Louisiana Electric Light Company, which has the contract of illuminating the streets of the city. The company complain that they have been in a great measure prevented from lighting the city in the manner called for by their contract by the cutting of their wires and the consequent breaking of the circuits.

—— Hoboken was in a blaze of glory Saturday night. The electric current was turned on, and the streets were brilliantly illuminated by the Thomson-Houston light. The citizens were pleased, as the light furnished was excellent, and a vast improvement over gas. Everybody was pleased, says a local exchange, except the mashers, coquettes and lovers, who have, protected by the sickly gas jets transformed Washington street into a lovers' lane. The love makers retired to the darker thoroughfares.

—— The Mayor of Waterbury, Conn., said in his inaugural address last week: "We can better light the city by electricity than by gas and naphtha is not unworthy of attention. In this department marked advancement has been made. While at its inception the electric light was fairly considered an experiment, it has now on the streets become a matter of practical necessity and utility. I apprehend that the introduction of this system by our department of lamps and gas has been more universally commended from its results than any other advanced step taken by the city for years. To realize this fact we have but to consider the nature and character of the complaints which would be sure to follow were the city, where the electric lights are now stationed, to go back to the old method of lighting by gas.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING JAN. 5, 1886.

333,563 Armature for dynamo-electric machines; Wm. Stanley, Jr., and Oliver B. Shallenberger, Pittsburgh, Pa.

333,564 System of electric lighting; Wm. Stanley, Jr., Pittsburgh, Pa.

333,573 Dynamo-electric machine; Elihu Thomson, Lynn, Mass.

333,698 Regulator for electric-light circuits; Wm. M. Thomas, Grand Rapids, Mich., assignor of one-half to the Grand Rapids Electric Light and Power Company, same place.

333,739 Electro-medical battery; Samuel France, Bourbon, Ind.

333,742 Electric illuminating apparatus; Ella N. Gaillard, New York, N. Y.

333,779 Electrical meter; Wm. C. Patterson, Elizabeth, N. J.

333,815 Process of obtaining gold, silver, copper, nickel, and cobalt from their ores by electrolytic action; Michael Body, Liege, Belgium.

333,816 Telephone; Jas. W. Bonta, Philadelphia, Pa., assignor to J. Daniel Eby, trustee, same place.

333,899 Heat regulating device; Henry B. Latham Jr., Philadelphia, Pa.

333,902 Magneto or dynamo-electric machine; Bene Thury, Geneva, Switzerland, assignor by mesne assignments to A. DeMeuron and Cuenod, same place, and George H. Benjamin, New York N. Y.

333,932 Telephone receiver; North Dowling, Philadelphia, Pa.

333,950 Circuit for electric railways; Frank L. Pope, Elizabeth, N. J.

333,955 Municipal alarm service; Wm. A. Stern, Pittsburgh, Pa., assignor of one-half to Eugene Ingold, same place.

BUSINESS NOTICE.

Dealers and Manufacturers in District Telegraph Goods, Electrical or Mechanical Watch-clocks, etc., are kindly asked to send circulars and lowest discount to FRANK M. FRITCH,
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Special Notice.

ELECTRIC LIGHT COMPANIES
AND MANUFACTURERS OF
Electric Light Apparatus, Machinery and Supplies
WHO DESIRE TO BECOME MEMBERS
OF THE
NATIONAL
Electric Light Association,

MUST MAKE APPLICATION
ON OR BEFORE
FEBRUARY 10, 1886.

ADDRESS ALL COMMUNICATIONS TO

J. F. MORRISON,
Pres. National Electric Light Association,
BALTIMORE, MD.

The first annual meeting of the above association will be held at the Carrollton Hotel, Baltimore, on February 10, 1886. Arrangements have been made with the proprietors of this hotel to entertain the delegates in attendance at the convention at $3 per day. This is a rebate of $2 a day on the regular prices, and includes all the facilities afforded by the hotel, board, lodging, etc. The convention will remain in session three or four days, affording ample time for discussion of all the important subjects relating to Electric Lighting. The several committees appointed at our last meeting in New York are now preparing papers to be read at the coming convention upon the various topics of interest as designated at that time. It is earnestly hoped that every man or company engaged in the Electric Lighting business will be represented at the meeting in Baltimore. Arrangements have been made for transportation at reduced rates, of which you will be advised in due course.

Baltimore extends a cordial welcome, and I trust that every interest engaged in Electric Lighting will be represented at this first annual meeting. Let it be a royal gathering.

Correspondence regarding this convention will be promptly considered and answered.

GEO. S. BOWEN.
Chairman Executive Com.,
ELGIN, ILLINOIS.

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MANUFACTURERS OF

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Five years' practical experience in the installation of these well-known systems of Arc and Incandescent Electric Lighting, enables the Company to give the most perfect, reliable and economical Electric Lighting known.

Among the most prominent installations which this Company has effected in the city and vicinity, are the following:

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Equitable Building,
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"AMERICAN SYSTEM"
OF ELECTRIC ARC LIGHTING,

(Wood's Patents.)

SPECIAL ADVANTAGES OF THIS SYSTEM. Completeness, durability, steadiness, quality of light and economy of power. The Wood dynamo-electric generator occupies less space, is lighter, requires less motive power, and costs less than others capable of producing an equal number of lights. There is less firing or flashing of the commutator, and consequently less loss of energy and wearing of the parts from this cause than is the case with other machines. It requires no oiling or other attention than to be kept clean, and its extreme simplicity enables it to be operated with the minimum of skill and attention. The current regulator and signalling apparatus, by which the machine is made to generate the exact current required for any number of lights from one to its full capacity—as they are turned off and on without change of speed or waste of power—is simple, effective, and safe. Its lamps are reliable in operation, the carbon-regulating mechanism being absolute in its control, durable, and unaffected by changes of temperature or weather. They are of ornamental design, and the steadiness and purity of light produced are unequaled at the same expenditure of power.

ESTIMATES FURNISHED For Central lighting stations, or isolated plants, for either the American Arc Lighting System or Edison Incandescent System, or for both combined.

SPECIAL ATTENTION given to installing isolated plants in Mills, Factories, Shops, Railroad Buildings, &c.

CONSTRUCTION WORK. Proper construction and installation of central stations and isolated plants is of great importance to insure safety and economy. The American Company has done more of this work than any other company in the United States, and its work is known to be superior to that of other companies.

PATENTS. This Company owns and controls all the Patents and Inventions for electric lighting of James J. Wood, J. B. Fuller, and many others heretofore controlled by the Fuller Electrical Co., and the Fuller-Wood Electric Light Co., which include the foundation patents of the Gramme dynamo.

"Among the different systems of arc lighting may be mentioned the Brush, the Weston, the Schuyler, the Thomson-Houston, and the Fuller-Wood (hereafter to be known as the American). The Fuller-Wood system of arc lighting has gained a world-wide reputation for reliability and economy. This organization was originally known as the Fuller Electrical Company, which dates its existence from 1878. This system was the foundation of the well-known Gramme Association, being the party of the first part in the articles of association, which was composed of the Brush, Weston, United States, Thomson-Houston, Edison and Joblacoff companies, which was good evidence that all the companies composing that association were willing to pay tribute to the superior merit of the Fuller Wood system.—*N. Y. Sun, Sept. 27th*, 1885.

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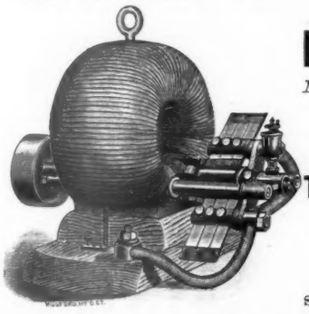

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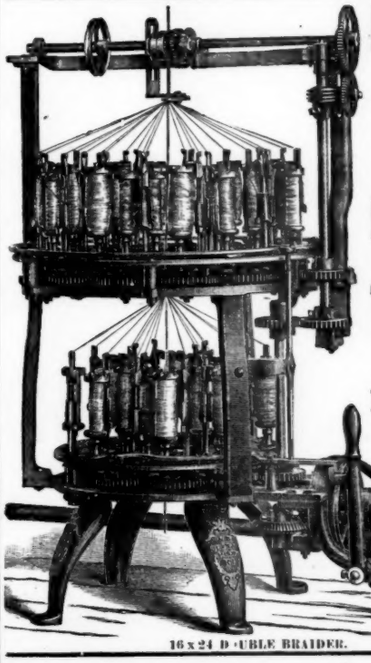

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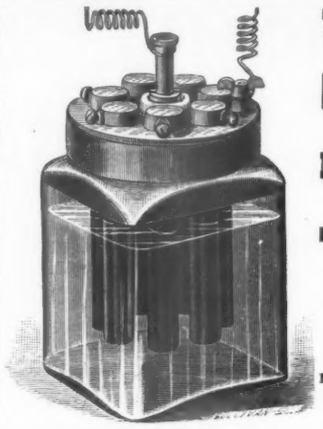

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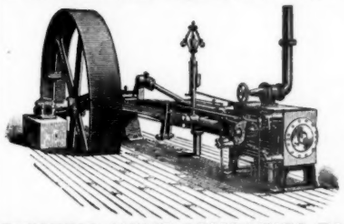

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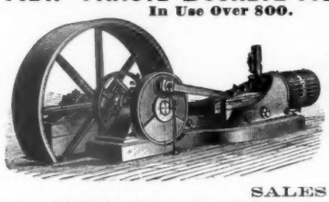

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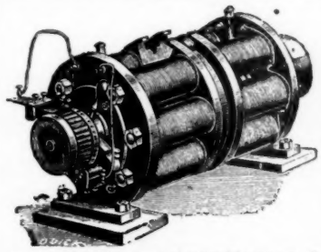

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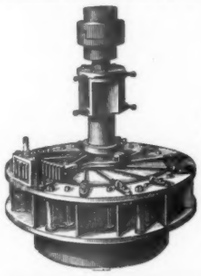

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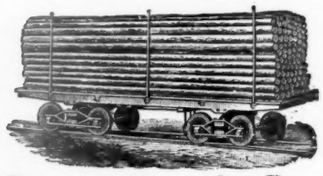

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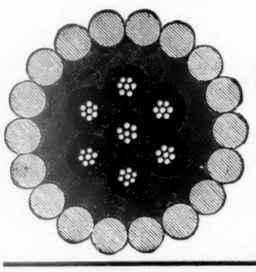

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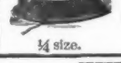

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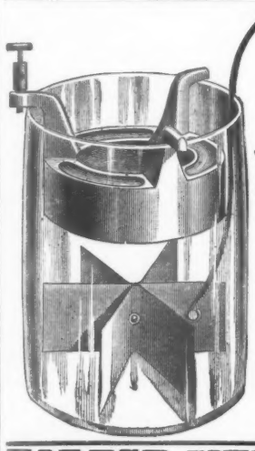

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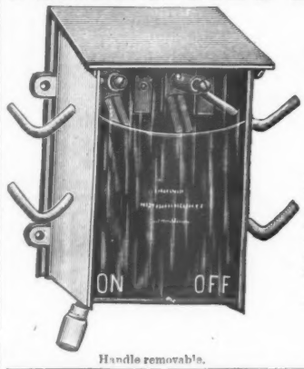

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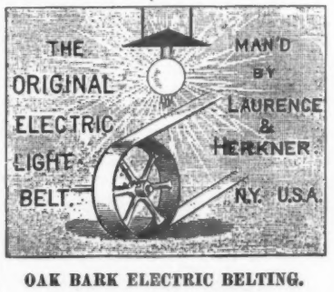

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